Food and Agriculture
Organization of the
United Nations

Enabling "Response-ability"

A stocktaking of farmer field schools on smallholder forestry and agroforestry

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Food and Agriculture Organization of the United Nations

Rome, 2023

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FOREWORD

This publication reviews how the current and potential application of farmer field schools (FFS) can strengthen smallholder forestry and agroforestry. Through thoughtful analysis and case studies, it makes a compelling case for the expanded use of FFS in forest and farm communities. It examines how this approach can be used to build more diverse and resilient forestry and agricultural production systems using trees that contribute to capturing carbon. This study provides evidence of the potential of FFS to support capacity building and the empowerment of rural people in the use of forests and trees to diversify production and improve livelihoods while contributing to climate change mitigation and ecosystem restoration.

At the Conference of the Parties (COP) 27, the Forest and Climate Leaders' Partnership (FCLP) was launched. This Partnership aims to boost action to implement a commitment made by over 140 countries at COP26 in Glasgow to halt forest loss and land degradation by 2030 and to convert ambition into results on the ground. This commitment builds on previous commitments made by the international community, including those of the Sustainable Development Goals (SDGs), where forests and trees are indispensable to delivering positive social, environmental and economic outcomes.

However, the success of this commitment with respect to forest and trees depends on having capacity in place at local levels or building it across a large part of the world's rural lands. Here, FFS provide a time-tested solution to strengthen the knowledge and skills of rural people, and have already reached over 20 million farmers. In practice, an FFS group comprises 20–30 farmers from the same locality. Supported by a trained facilitator, participants meet regularly, covering the whole productive cycle. Participants learn how to improve their skills by observing, analysing and trying out new ideas on collective FFS study plots before or while implementing them in their own farms. Building on their local knowledge systems, farmers are encouraged to solve problems through experimentation as well as to develop observation and monitoring skills.

Over the last three decades, FFS have proven to be an effective action-learning approach to help rural populations innovate with more clarity and purpose while building the social skills needed for rural transformation. With an initial focus on crop pest management, FFS expanded to broader, holistic agro-ecosystem management. Bringing together applied biology, experimentation and non-formal education, the FFS approach provides a platform for rural education and empowerment. FFS have addressed a wide range of topics regarding crops, livestock, soil water and landscape management, integrated farming systems, business, climate change and more. Active in many countries and regions, they adapt their key features of ecological literacy, discovery-learning and farmer collaboration to solve immediate problems in local contexts that have global implications. Numerous programmes have also applied the FFS approach to different aspects of agroforestry.

There is a vast potential for applying the FFS approach to forestry and agroforestry. According to the State of the World's Forests (SOFO) 2022, forests cover about 31 percent (4.06 billion ha) of the world's terrestrial lands. In addition, 1.5 billion ha of degraded land would benefit from restoration, and increased tree cover could boost agricultural productivity on another 1 billion ha. Restoring degraded land through afforestation and reforestation could effectively take 0.9–1.5 $GtCO_2e$ per year out of the atmosphere between 2020 and 2050. Furthermore, these lands are home to at least 1.6 billion people, and many others depend on the goods and services they produce, such as the 2.6 billion people relying on wood and traditional fuel for cooking. The task now is to adapt and expand the application of FFS to better support agroforestry and forestry by local people, and this publication points the way.

This publication could not be timelier. Forestry and agroforestry extension programmes for forest and farm communities have not kept up with needs in many places. Furthermore, FFS approaches to capacity development often rely on the transfer of technically developed solutions to local people rather than on building a culture and community of learning in the rural sector. Here, FFS provides another pathway for capacity development that is more adaptable and resilient through its focus on local problem solving, empowerment and community building, blended with technical and expert inputs. This is an approach that will stand local people well in these times of environmental, economic and health uncertainty.

FFS are both essential and insufficient to address some of the structural factors that keep rural people on the side-lines of contemporary societies. Yet, it is unlikely that the forestry and agroforestry sector will be able to meet agreed goals under international agreements, or to build prosperous and resilient rural communities without a large expansion in the use of this or similar approaches to building local capacities. As the author of this report describes, FFS participants have characterized this approach as life-changing. Our hope is that the readers of this document will find it compelling, and that it will inspire them to support the expansion of FFS on forestry and agroforestry around the world.

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EXECUTIVE SUMMARY

Through enhanced understanding of agro-ecological dynamics and farmer-led experimentation, the farmer field schools (FFS) have enabled tens of millions of farmers across the globe to sustain or improve productivity while reducing their dependence on externally based inputs. Agroforestry and forestry applications promise to enhance the environmental integrity and socio-economic impacts of FFS, mainly by increasing the presence of perennials in production systems, useful for stabilizing food security and strengthening on-farm ecosystem services.

From 2020 to 2021, FAO conducted a stocktaking study to identify opportunities, challenges and lessons learned in the application of the FFS approach in forestry and agroforestry. Through the review of over 400 documents (peer-reviewed and grey literature), 36 in-depth key informant interviews and a stakeholder workshop, the stocktaking evidenced that FFS was adapted to forestry in Southeast Asia as early as the mid-1990s. Twenty-one major FFS programmes in forestry and agroforestry were identified, with over 200 000 graduates distributed across every region of the Global South. Common topics included coffee, cacao, citrus, mango, other fruit tree production and plantation management. FFS have also addressed the use of trees and other perennials in soil conservation, pastoral/rangeland management, timber and fuelwood production, as well as watershed and landscape management.

The technical content and conservation orientation of forestry pose challenges for the shorter-term agronomic foundations and production orientation common to FFS, which have led to interesting adaptations of the approach. Three decades of FFS experience in forestry, particularly agroforestry, have produced a wealth of learning curricula, lesson plans, technical guides and testimonies. This work has taken place in multiple geographic, environmental and social contexts – from arid and semi-arid savannahs to high rainfall mountain environments. This experience represents a diverse, well-tested, decentralized and locally situated knowledge base on which to build future programmes aiming at strengthening farmers and forest dwellers' capacity to create sustainable agricultural systems that include trees and perennial crops.

As found in integrated pest management (IPM) and other thematic areas, lingering institutional commitment to expert-oriented development continues to pose obstacles to broader uptake of FFS on agroforestry and forestry. Respondents pointed to occasional challenges in programme design and implementation, including ensuring the active role of participants in problem analysis, programme design, process management, and monitoring and evaluation. Overall, the contributions of FFS to people-centred forestry extension depend on the quality of implementation, in particular regarding process, adherence to adult education, and user-led technology development that ultimately empowers users.

There is a need to help the millions of farming families from across the Global South to become part of the growing international community committed to rehabilitating ecologies and restoring ecosystems. Strategic mobilization of FFS on forestry and agroforestry can enable rural people from diverse geographical contexts to advance the grassroots knowledge, skills and social organization needed for more environmentally friendly food production and natural resource stewardship.

In particular, the stocktaking found immediate opportunities in: (i) bringing together and collating the work carried out to date on FFS on forestry/agroforestry (curricula, learning activities and guides); (ii) applying insights and lessons learned in people-centred development to activities supporting forestry and agroforestry (e.g. enabling ecological literacy in perennials, forests and conservation, facilitating relevant farmer-led experimentation, increasing inclusion and social organization at the farm, forest, watershed and landscape levels); and (iii) investing in the inherent complementarities between agriculture and forestry training and extension (e.g. enhancing ecosystem services of agriculture, improving short- and longer-term economic return and social organization in forestry, exploring cross-financing, and implementing joint initiatives).

In terms of next steps, the study recommends: mobilizing resources for immediate expansion and implementation of FFS programmes seeking smallholders and family famers' empowerment and leadership in sustainable production and development; systematically and strategically including women and youth as participants and new leaders in forestry learning and innovation; curating FFS experiences in regenerative agriculture and agroforestry; scaling up through both inward and outward growth; and using polycultures for greater food security, soil health and land restoration. To have the desired impact, FFS (and other people-centred approaches) must continually emphasize quality – not just in increased production, but also in productivity, the biological/ecological performance of an alternative, user-centred learning process, leadership and social organization. In order to transition towards systemic approaches necessary for sustainable and integrated farm systems, it is essential to overcome more linear, mechanistic ways of generating and transferring knowledge and building capacities at local levels, and this can be supported by the FFS.

ACRONYMS AND ABBREVIATIONS

ADB	Asian Development Bank
AFFS	Agroforestry farmer field school
CATIE	Centro Agronómico Tropical de Investigación y Enseñanza (Tropical Agricultural Research and Higher Education Center)
CBF	Community-based forestry
CIFOR	Center for International Forestry Research
CSA	Climate-smart agriculture
FAO	Food and Agriculture Organization of the United Nations
FCV	Farmer coaching visit
FENAPROCACAHO	Federación Nacional de Productores de Cacao de Honduras
FFF	Forest and Farm Facility
FFS	Farmer field school(s)
FMNR	Farmer-managed natural regeneration
FUG	Forest user group
GEF	Global Environment Facility
GHG	Greenhouse gas
IFAD	International Fund for Agricultural Development
IPM	Integrated pest management
JICA	Japanese International Cooperation Agency
Kagera-TAMP	Transboundary Agro-Ecosystem Management Project for the Kagera River Basin
KTDA	Kenya Tea Development Agency
MACRENA	Community-based Natural Resource Management
NTFP	Non-timber forest product
NWFP	Non-wood forest product
PHBM	*Pengellaan Hutan Bersama Masyarakat* (Managing Forests with the Community)
PPP	Public-private partnership
SLM	Sustainable land management
SOC	Soil organic carbon
SWOT	Strengths, weaknesses, opportunities and threats
TOF	Trees outside forests
UNEP	United Nations Environment Programme
USAID	United States Agency for International Development

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1. INTRODUCTION

Since its creation in 1945, the Food and Agriculture Organization of the United Nations (FAO) has been operating under the motto, *fiat panis*, "let there be bread". Charged with the task of leading international efforts to defeat hunger and improve nutrition and food security, FAO has focused on issues of food production while, over time, diversifying its activity to help countries address emergent crises and new areas of concern. Hunger and malnutrition continue to be major challenges, with growing awareness that humans have become a major player on the planet whose most basic activities such as the daily search for food and energy are intricately involved in degrading the earth's ecosystems. There is an international scientific consensus that this situation puts into question not just the possibility of tackling hunger, but also our very survival as a species.

Pressures on productive land and water resources are pushing the productive capacity of agricultural ecosystems to the limit. Land degradation, drought and related water scarcity are compromising agricultural production and intensifying poverty and malnutrition across the planet (FAO, 2022a). Biodiversity and the services it provides are declining due to the increasing impacts of land and sea use change, overexploitation, climate change, pollution and invasive alien species (CBD, 2020). According to the Remote Sensing Survey of FAO's Global Forest Resources Assessment 2020 (FAO, 2022b), the main driver of global deforestation is cropland expansion (including oil palm plantations), representing almost 50 percent (86 Mha); the second most important direct driver is livestock grazing, accounting for 38.5 percent (67 Mha). Large- and small-scale farmers are part of broader socioeconomic and cultural trends tied to population growth, urbanization and increased energy consumption (Hosonuma *et al*., 2012). Although the rate of deforestation has declined by around 29 percent during the 2010–2018 period compared with the first decade of 2000 from 11 million ha per year (Mha/year) to 7.8 Mha/year (FAO, 2022b), agriculture, and food and its production, circulation and consumption account for 34 percent of the greenhouse gases (GHGs) associated with climate change (Crippa *et al*., 2021). Due to the current and future threat of climate change, countries must prioritize not just their ability to adapt to the effects of unstable weather, but also investment in global climate mitigation, in particular through the terrestrial sequestration of global GHGs.

In parallel, growing recognition of the limitations of external, input-intensive food dependence led to an increased understanding of the importance of re-carbonizing soils and farms as a means of rehabilitating soil biology. A growing body of research over the last 20 years highlights the importance of mycorrhizae and rhizobacteria, among other microorganisms, which together contribute to the reach of crop roots, plant moisture and nutrition absorption, the biochemical signalling of plant defences, and ultimately, plant health and growth. In addition, it has become clear that storing carbon in the soil, especially in the stable form of microbial necromass,[1] will be essential for meeting carbon neutrality commitments by 2050. Most likely, mitigation targets at this scale can only be achieved with the help of the planet's 460 million smallholder farmers who operate the land and own the contextual knowledge needed for rehabilitating the soil, forests and landscape in localities across the planet (Lowder *et al.*, 2021).

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[1] As summarized by Ma *et al.* (2018), studies show that microbial-derived carbon is central to the build-up of soil organic carbon (SOC). With the decay of plant materials, soil microbes convert available carbon into microbial-processed compounds along with their own biomass – together known as "necromass". As microorganisms attach to soil surfaces, microbial residues accumulate on soil fractions. While microbial biomass has a fast turnover and constitutes a tiny fraction of SOC, microbial necromass is relatively stable, often lasting hundreds of years, over time contributing to SOC accumulation.

In summary, the most pressing challenge is not just helping the world to feed itself, but also, doing so in ways that rehabilitate the functioning of ecosystems. Evidence shows that the current global food systems – with their production, transportation and consumption modalities – have become a primary source of human health and environmental decline (Foley *et al*., 2011; Clark, Springmann and Tilman, 2019). According to recent studies and the Intergovernmental Panel on Climate Change (IPCC, 2022) update, given that temperatures are rising towards limits that may begin to oxidize or burn off terrestrial plant life, there may only be three to four decades to correct ecologically degenerative agriculture (Duffy *et al.*, 2021).

Humans are at a critical juncture where farming must become more productive and resource-conserving while playing a central role in sequestering carbon. Arguably, the central question is not whether this transition towards regenerative agriculture and food is possible, but rather, how to achieve it. This is a task that will require unprecedented "response-ability": i.e. a stronger ability to respond to this challenge in terms of socio-biological affect and effect, as well as depth and breadth of innovation for the required institutional change.

1.1 Social and community forestry: 45 years of promoting smallholder and community interests

Four decades ago, a group of people working in FAO's Forestry Division became part of an ambitious effort to promote increased community involvement in the design, planning and implementation of rural development. This people-centred approach sought to provide a platform for historically marginalized rural populations, in particular, Indigenous Peoples, for determining a pathway out of poverty and exclusion. The transition towards people-centring was achieved by creating space for users in the design, implementation and evaluation of forest interventions as an alternative to the technology-centred designs in industrial forestry (Table 1). Subsequently, different forms of smallholder forestry, agroforestry and community forestry emerged as part of a growing movement that places rural families and their communities at the centre of natural resource management. It is well beyond the scope of this stocktaking to provide a full treatment of the rich history or social/community forestry, but it is necessary to establish its central qualities.

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Table 1. Technology- and people-centred agricultural development

Characteristics	Technology-centred development	People-centred development
Primary source of change	Exogenous – induced through specialized, usually external sources of information and technology	Endogenous – induced through localized contingency and ongoing practice of living
Knowledge	Expert – specialized and highly standardized, quantifiable, and preoccupied with rigour and objectivity	Lay – general and highly diversified, qualitative and highly subjective
Time	Discrete – bound by beginnings and ends	Indiscrete – not divided into parts or separated
View of local actors (e.g. farmers)	Passive – limited knowledge and in need of assistance	Active – knowledgeable and capable of solving problems
Exchange	Commoditized and mediated through currency and markets	Non-commoditized and mediated through social relationships
Logic behind decisions	Monetary costs vs. monetary benefits	Nurturing social relationships
Concern	Adoption – what people are not doing; trying to convince people to do something differently.	Common understanding – what people do and why; work with people to advance a common agenda.

Source: Sherwood, S., Schut, M. & Leeuwis, C. 2012. Learning in the social wild: Encounters between farmer field schools and agricultural science and development in Ecuador. In: H. R. Ojha, A. Hall, & V. R. Sulaiman (eds.). *Adaptive collaborative approaches in natural resources governance: Rethinking participation, learning and innovation*, pp. 102–137. Oxford, UK, Routledge.

FAO has defined and applied community forestry in a diverse manner. Initially, social forestry, or community-based forestry (CBF), was used to distinguish between the tradition of public access to and use of natural forests through governance via community groupings or the state, and privatized, commercialized industrial forestry by large-scale companies or international corporations. At first, CBF covered forestry managed by users (i.e. in particular, the poor and marginalized) and their communities, which can include the management of tree stocks outside of natural forests, for example, on family farms, pastures and roadways, along waterways and across the landscape. Here, in line with the priority of this stocktaking, by collaborating with the largely production-oriented FFS movement, a common agenda of smallholder agroforestry is emphasized over other aspects of community forestry, such as collective management of common-pool resources, including woodlots for fuelwood and timber or natural forests for further purposes.

According to FAO's The State of the World's Forests (2022), smallholders, local communities and Indigenous Peoples own or manage at least 4.35 billion ha of forest and farmlands worldwide, and 91 percent of indigenous and community lands are in good or moderate ecological condition. Over time, community-based approaches in natural resource management and rural development, in general, have contributed to securing the rights of rural communities and Indigenous People while building individual and collective capacities for more productive, socially equitable and sustainable development and conservation.

Numerous reports on the state of sustainability in agriculture, agrobiodiversity, natural resource management and climate have led to a growing recognition of the importance of reintroducing perennials (both fruit and forest trees species) into farming, which has become dominated by short-term annual crops, as a means of addressing biodiversity loss, stabilizing production in an era of rising climate variability, fixing atmospheric carbon, and enabling sustainable landscape management (McIntyre *et al.*, 2009; NRC, 2010; GO-Science, 2011; FAO, 2013). As recently argued by Zinngrebe *et al.* (2020), this situation creates an urgency to connect actors in conservation and agriculture in order to mainstream agroforestry and operationalize more integrated landscape governance. This will require a redirection of both public and private funding towards continuous seed funding to facilitate integrated learning processes capable of transforming landscape degradation to sustainability while reducing transaction costs.

1.2 Farmer field schools: empowering farmers through ecological literacy

In the late 1980s, faced by the health, economic and environmental problems associated with the overuse of external inputs in agriculture, such as chemical pesticides, a group of innovative entomologists at FAO and non-formal educators at the non-governmental organization (NGO) World Education started working together on issues regarding rice production in Southeast Asia. They developed and applied an innovative knowledge-based, learning-action approach linked to the phenological stages of crops, which became the "farmer field school" (FFS) (Box 1). Several studies, such as the ones reviewed by van den Berg and Jiggins (2007) and van den Berg *et al.* (2020), show that the FFS is not only an extension method, but can also increase farmers' knowledge of biology and ecosystems, self-confidence, problem-solving skills, group building and political strength.

By design, the FFS draws on insights from adult education, in particular, concerning self-directed, experiential learning as a means of helping rural people discover for themselves the basic biological and ecological functioning that underlies agriculture while acquiring self-esteem and practical problem-solving skills needed for devising effective alternatives. Also, by working in community groups, the FFS seeks to help participants build social skills and organizational capacities to represent, defend and advance collective interests.

Since its initial work in integrated pest management (IPM) in rice, which began in the late 1980s, by 2005 it was estimated that in its first two decades of activity, FFS had reached between 10 million and 20 million farmers in about 90 countries (FAO, 2019). Since their inception, thematic applications of the FFS approach have greatly diversified to include new crops and animal production, with a focus on soil, water, seed and plant health, as well as different aspects of product development, marketing, maternal/child health and nutrition, agroforestry and climate change – a demonstration of the robustness of applied action-learning.

Action-learning involves thinking and action in concert. It is based on the idea that learning is a continuous process and best achieved with an open, probing mind, and an ability to listen, question and explore ideas, not just as individuals but also in groups. The action-learning process brings peers together in reflective experience in a supportive environment. It stimulates transformation, helping individuals, their communities and organizations advance common objectives, such as decreasing costs, increasing production and increasing farm productivity.

Box 1. What is a farmer field school?

THE NON-FORMAL EDUCATION PROCESS is characterized by hands-on group learning

THE FARMER-CENTRED APPROACH is adapted by the local population

THE SEASONAL TRAINING PROGRAMME OVER AT LEAST ONE PRODUCTION CYCLE – from seed to seed, egg to egg, or calf to calf

The FFS approach:

- **builds on local knowledge systems** while testing and validating scientific concepts developed elsewhere;
- **enhances participants' skills for critical analysis** and problem-solving;
- **develops observation skills,** transforming them into scientific evidence;
- **promotes collective action,** fostering group cohesion and community decision-making to improve agriculture and livelihoods;
- **helps rural communities transform current production systems**, driving changes towards more sustainable practices and systems.

An FFS group:

- **comprises 20–30 farmers** (or livestock or fish producers) from the same locality who are interested in learning about improved practices;
- **is supported by a trained facilitator**;
- **meets regularly during the growing season/productive cycle,** often on a weekly basis;
- **carries out experiments** – farmers identify production problems, brainstorm potential solutions, and then set up study plots to compare local practices and improved practices;
- **promotes empowerment beyond the field**;
- **fosters social capital building** at the community level.

A weekly session includes:

- **Agro-ecosystem analysis (AESA)**. FFS participants observe and monitor all elements of the agro-ecosystem and farm, and learn how to make management decisions. They work in small groups and collect all the data from their experiments. Each group prepares a poster to summarize the findings, discuss the situation observed and present management options. Participants debate the proposed options and agree on the best. FFS facilitators ensure full participation and help the group reach a sound technical decision. The collective recommendations are implemented in the learning plot, and the process is repeated throughout the season. The AESA is used not only for crops, but also for livestock and fish, measuring different elements while always looking at the wider production ecosystem. [Photo A]
- **Group dynamics activities**. These activities are used as icebreakers and for learning about teamwork. They enhance group cohesion and make learning more fun. [Photo B]
- **Topic of the day**. Through the 'topic of the day', participants gain in-depth knowledge about specific issues. A wide range of special topics may cover technical issues or any subject of importance to the group, such as basic business skills, nutrition, gender roles and HIV/AIDS. For example, 'setting up an insect zoo' is a discovery learning process that teaches about the functions of insects and predation: pests and their natural enemies are put together in a vial, and farmers observe how they react. [Photo C]

More information on FFS can be found on the **Global FFS platform:**
www.fao.org/farmer-field-schools

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Source: FAO. 2019. *Farmers taking the lead: thirty years of farmer field schools*. Rome, Italy, FAO. 72 pp. www.fao.org/publications/card/en/c/CA5131EN

Essentially, action-learning is about learning in a particular social, cultural and biological context. Working together, FFS participants seek to overcome obstacles to their well-being and realize objectives. Medium- and long-term studies have shown that well-implemented FFS can result in increased ecological literacy, reduced use of external inputs, and increased farm productivity and gender equity (Pretty and Bharucha, 2015; Settle and Hama Garba, 2011; van den Berg *et al.*, 2020;Waddington *et al.*, 2014; Friis-Hansen, Duveskog and Taylor, 2012).

Contributions have also extended beyond the family farm to collective social, cultural, public health and environmental interests. Over time, many FFS graduates have become leaders in their communities as well as influential actors in rural development agencies and government (FAO, 2000; van den Berg *et al.*, 2020). While some FFS graduates simply return to farming, armed with new information, observation tools and experimentation skills, others become active agents in a number of emergent global movements, for example, for the elimination of toxic pesticides, the emancipation of rural people, or other collective matters of interest such as family farming and agroecology. For these graduates, agriculture is no longer just a means of feeding their family, putting products on the market and earning a living, but also a means of expression and social action, for example, against the unwanted consequences of current agriculture and food systems.

1.3 Taking stock of FFS on agroforestry and other forestry-related themes – rationale and methodology

The general purpose of this stocktaking study is to summarize and better understand the experience of using FFS in the two related areas of smallholder forestry and agroforestry, referred to here as "FFS on forestry" and "FFS on agroforestry", respectively.[2] This report explores how this experience could be strengthened and mobilized for improving capacity building and enabling farmers, communities and small-scale producers to address their most pressing concerns, such as social inequities and marginalization, poverty, hunger, as well as mass resource degradation and climate change. To date, the FFS approach has more commonly been applied to fields of smallholder production, including agroforestry, than to natural resource management such as water, soil and natural forest management. This was largely due to the methodology's group-learning orientation, its roots in production, and the dynamics of farming cultures.

Due to the pressing livelihood challenges of families living in rural areas, aggravated by the effects of broad-scale resource degradation, including climate change, FAO and its partners seek to strengthen locally situated, community-based innovation for greater productivity, human health and sustainability. After decades of progress in social and community-based forestry (CBF) and the over 30 years of applying the FFS approach, there has been little or no application of FFS to CBF. FAO has extensive experience in human-centred, peer-to-peer learning, common-pool resources, land tenure and the management of multiple-use perennial bushes and trees, which is especially important for addressing the production and livelihood challenges in an era of growing climate variability and degraded environments marked by growing labour shortages in rural areas. Its CBF offers an experience that could help strengthen the profile of perennial species and their products in the agriculture communities serviced by FFS.

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[2] Please note that, here, FFS that are specialized in agroforestry systems are referred to as "FFS on agroforestry", and FFS that are specialized in forestry systems as "FFS on forestry" (see Glossary in Annex 1 for a full definition). Since the vast majority of FFS applications to these topics are in agroforestry, the term "FFS on agroforestry" may be used as the generic term referring to both. Given the rich diversity of FFS contexts and applications, in some cases, the lines between forestry and agro-forestry may be blurred.

The objectives of the stocktaking were as follows:

- Summarize the work to date: What were the experiences in the application of the FFS approach to community and smallholder forestry and agroforestry?
- Identify insights and lessons learned: What special understanding does the experience of FFS on forestry and agroforestry provide for strengthening forestry and agricultural extension?
- Identify promising next steps: What are the existing opportunities for a strategic collaboration between forestry and agroforestry and agriculture extension?

The stocktaking took place between September 2020 and the end of January 2021. Due to the limitations of the ongoing COVID-19 pandemic, it was largely based on a text analysis of the grey and published literature on FFS on forestry-related areas. Common technical themes included integrated crop production, intensive plantation production, agroforestry, and multi-stakeholder and collaborative management of natural areas and landscapes. The stocktaking relied on over 400 sources, including programme documents, training guides, online videos, donor reports, student theses, and academic and popular publications.

The literature review was complemented by an open-ended exploration and based on 40-60 minute oral interviews, initially with 30 key actors. The researchers explored the on-the-ground experience of current practices in FFS on forestry and agroforestry. Efforts were made to include experienced actors throughout the regions of the Global South with relevant work experience in Central America (Honduras, Guatemala and Nicaragua), South America (Ecuador and Brazil), Africa (Burkina Faso, Ghana, Ethiopia, Kenya, Uganda and United Republic of Tanzania), South Asia (India) and Southeast Asia (Indonesia, the Philippines and Thailand). Snowball sampling was used to broaden the range of informants to an additional 20 people. Interviews were semi-structured and organized around three general areas: personal/professional experience with FFS on agroforestry; strengths and weaknesses of FFS and FFS-like approaches; and political and institutional enablers and barriers. This was followed up with a review of texts – project reports, training manuals, technical guides and video footage – to comment on the performance of reported experiences in FFS on agroforestry and on forestry-related themes.

In December 2020, a two-hour online stakeholder consultation was held with 18 participants from diverse agencies working on different aspects of rural development and natural resources management. The aim was to share and receive feedback on initial findings from the stocktaking. During the activity, further literature and case study material useful for strengthening the stocktaking were identified and additional opportunities explored for strengthening the use of FFS and other approaches in community forestry and agroforestry sectors.

MAUDINDO
MBEU LOMWE
LIMA
CHIMANGA, MAPILA, NANDOLO
Mavuto omwe amakuma ndi mbeu ya chimanga.
NO YA MA CBF NDI F.F.S
CBF
F.F.S

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2. THE CONCEPTUAL FRAMEWORK: ENABLING "RESPONSE-ABILITY"

2.1 Knowledge as continuous inquiry

For pioneers in experiential learning in the early 20th century, such as John Dewey (Box 2), knowledge is not reducible to facts, but rather, constitutes part of a dynamic and endless process of inquiry – an open-ended, experimental and practical art embedded in experience. FFS seek to provide participants a safe space to affect and be affected.

Box 2. Farmer field schools based on John Dewey's theory of inquiry

A pioneer in experiential learning in the early 20th century, John Dewey (1938) was a proponent of pragmatism, a view that rejected the dualistic epistemology of modernization (mind vs. body, reason vs. emotion, nature vs. culture, self vs. society) in favour of a naturalistic approach that viewed knowledge as arising from an active adaptation of the human organism to its environment.

According to the farmer field school (FFS) approach, participants run real-time demonstrations and on-the-field experimentation, such as an insectary of a problematic pest, to become experts on their life stages and cycles, and critical moments of vulnerability in order to intervene. According to Dewey's theory of inquiry, the participant should not be understood as having a mind that passively observes the world, but rather, should actively adapt, experiment with and innovate, as well as remember. In working with groups of experienced farmers, the FFS seek to evoke individual memories about particular problems and events in ways that provide participants access to lifetimes of success and failure. Working together, they join forces in mining a group's collective knowledge and put this experience to work on common problems.

Van der Ploeg's (2003) study of modernization in Dutch agriculture and food describes the creation of the passive, disembodied "virtual farmer" partially or wholly dependent on the knowledge of others – particularly, the formally trained agronomist. Agricultural modernization was a historical event spanning the 19th and 20th centuries, generated by the introduction of at least three impactful innovations: (i) the commodification of life and the introduction of currency and financial systems as the principal means of intermediating relationships; (ii) the physical and social distancing of markets (leading to the creation of the anonymous "consumer" and "producer"); and (iii) dependence on externally based knowledge and technology (i.e. the historical arrival of the "technical expert"). In practice, agricultural modernization has involved the institutionalization of expert-led knowledge production, taking over practice-led knowledge. (See Annex 2 for a summary of key differences among different types of knowledge production.)

The initial contributions of agricultural modernization can be seen as highly successful in terms of its generation of major changes in agriculture and food production in countries across the planet. However, substantial research shows that this progress did not come without a cost. Over time, modernization produced *externalities* that have now become the expected, if unwanted, products, or *internalities* of industrialized food, fibre and timber production. There is a serious problem when the expected products of the most basic livelihood activities include land degradation, large-scale environmental pollution, biodiversity decline, exclusive markets, social marginalization as well as climate change.

2.2 Advancing socio-biological "response-ability"

Transforming global food and agricultural systems requires fundamentally re-imagining and revising institutional designs and purposes in agriculture, food and natural resource management that undermine the environment. Growing awareness of this need has led to a call for change towards more productive, sustainable and even regenerative development, and for policy re-directions among actors in universities, the International Fund for Agricultural Development (IFAD), FAO, members of CGIAR research centres, bilateral donor agencies and philanthropic organizations (see McIntyre *et al.*, 2009).

Insights to guide this process of institutional change can be drawn from Donna Haraway (2016). The FFS, when fully implemented, may serve as high-potential pedagogy for greater "response-ability" in agriculture, food and natural resource management.

Beyond the moral and ethical call for responsibility in food, agriculture and natural resource management, drawing on the work of biologist and feminist scholar, Donna Haraway, "response-ability" (i.e. to enable a response) is evoked here as an embodied sociobiological sensibility to feel and act in co-existence with one's environment – be it in a field, tree stand, forest or market. Haraway summarizes "response-ability" as the product of continuous feedback based on a sense of interdependence between oneself and others, including the realm of the non-human.

The FFS experience does not simply seek to produce a public demonstration of scientifically informed best practices in agriculture or forestry. As illustrated below, top-down transformation of the FFS experience is one of the greatest threats to the effectiveness of the FFS pedagogy. Through problem-based, open-ended, discovery-based inquiry into hidden socio-biological realities, FFS participants can undergo a transformative experience that enables them – as both individuals and a collective – to access and unlock biological and ecological opportunities for social change. Haraway summarizes the successful co-existence of multiple species, such as microbes, plants, cattle and humans in regenerative agriculture as "composting". Recognizing that ecosystems are continually entangled and dynamic, Haraway encourages people to "stay with the trouble" – to always keep one's hands in the ground and dirty.

In practice, the FFS not only promotes classical composting of organic material, but also provides a rare and much-needed opportunity of what Haraway (2016) describes as sociobiological "composting" (i.e. reducing the distance between people and their environment). This can be achieved through, for example, contributions to a participant's analytical and problem-solving skills, self-worth, self-esteem, confidence, creativity and leadership related to ecological literacy in such areas as the soil, insects and disease, plants, farming and broader ecosystem management. Studies show that ecological literacy can help farmers make sense of fundamental biological and ecological processes, which in turn can help people to appreciate and (re)connect with nature (Orr, 1992; Sherwood, 1997). In this regard, in the context of FFS, ecological literacy is understood as a powerful entry point and means to the broader objective of "response-ability". As numerous studies over the last three decades have shown,[3] when successful, FFS can contribute to transformative levels of social and biological "response-ability" by unfolding new degrees of creativity, knowledge and technology development, and social organization and development in response to problems that were previously perceived as insurmountable. Having established socio-biological "response-ability" as a metaphor and high-potential intervention, a stocktaking of experience in FFS on forestry and agroforestry is presented.

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[3] For a recent summary, see van den Berg *et al.*, 2020.

3. EXPERIENCES OF FARMER FIELD SCHOOLS ON AGROFORESTRY AND FORESTRY-RELATED THEMES

3.1 Overview of farmer field schools on agroforestry and forestry

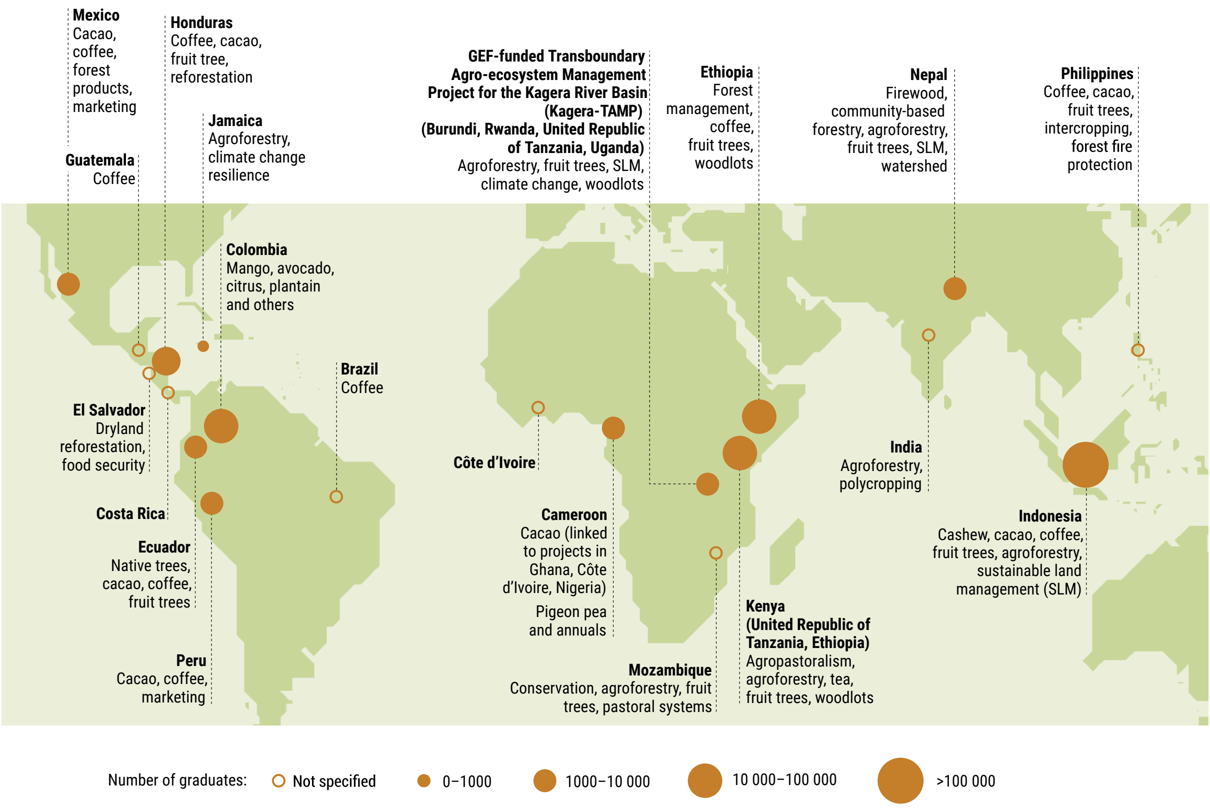
Since the early 1990s, a number of FFS have either directly or indirectly addressed the following major forestry- or agroforestry-related themes: (i) fruit tree and plantation management; (ii) dryland woodlots and pastoral systems; (iii) agroforestry; (iv) soil conservation, conservation agriculture, and climate change adaptation and mitigation; and (v) community forestry management. Annex 3 summarizes some of the most significant examples of FFS on forestry and FFS on agroforestry, illustrated in Figure 1.

Following initial consultations, the stocktaking showed that there were very few applications of the FFS to large-scale forestry and community forestry. It became clear that most FFS applications were in agroforestry and small-scale forestry. This is in part because FFS has been developed as an educational approach to work with smallholders with limited resources and capacity. During the past decade, development practitioners have begun to apply the FFS approach to deal with landscape-level concerns, such as watershed and natural forests management, and climate change. For rural dwellers, addressing off-farm systems involves introducing new sets of actors, scales and concepts to the FFS action-learning experience. Abstractions associated with working on off-farm dynamics, for example, understanding water and nutrient cycles at the landscape and global levels, posed new challenges to the time-proven FFS principles of contextual grounding, practicality, self-directed learning and farmer-led experimentation. While from a scientific perspective, understanding and acting at these levels may be highly relevant to a community, it might be challenging for individual families to relate to and interact with such concepts based on their experience, interest and observations. As a result, the immediate challenge when applying FFS to an off-farm dynamic is to find ways to make participants understand the relevance of understanding such concepts for their livelihoods and give them the tools to engage with them with confidence and ease. The experiences discussed in the following sections provide an overview of how different programmes and practitioners have adapted FFS programmes to respond to this challenge.

An FFS leader in Mozambique explained that the dearth of FFS forestry applications was due to the nomadic cultures common to many pastoralist and forest dwellers, as well as the collective management of natural areas as a common-pool public resource. Developed in smallholder and family farming, the FFS central design features, learning activities, participant-led experimentation and social organization lend themselves to more sedentary communities and production-oriented activity. Smallholder learning and innovation in agroforestry emerged as the logical point of encounter between forestry and FFS – a space for advancing a common interest in people-centred development practice as well as strengthening production-oriented farming through the biological and ecological insights of natural systems. FFS implementers in Southeast Asia found that FFS on agroforestry was an opportunity to further integrate the many actors involved in food and fibre production, including those working in crop and livestock production and forestry.

The following sections highlight lessons learned from 21 experiences, focusing qualitative attention on the technical platform, organizational arrangements and implementation approach. The final section of this publication focuses on the successes to date and ongoing challenges of institutionalization in terms of targeting the most relevant technical themes, transitioning to a greater balance in modes of knowledge production (as discussed in the previous section), and building partnerships and alliances for shaping the politics and practice of people-centred development for more productive and regenerative rural livelihoods.

Figure 1. FFS on forestry and FFS on agroforestry-related initiatives identified during the stocktaking study


Mexico
Cacao, coffee, forest products, marketing
Honduras
Coffee, cacao, fruit tree, reforestation
Guatemala
Coffee
Jamaica
Agroforestry, climate change resilience
GEF-funded Transboundary Agro-ecosystem Management Project for the Kagera River Basin (Kagera-TAMP) (Burundi, Rwanda, United Republic of Tanzania, Uganda)
Agroforestry, fruit trees, SLM, climate change, woodlots
Ethiopia
Forest management, coffee, fruit trees, woodlots
Nepal
Firewood, community-based forestry, agroforestry, fruit trees, SLM, watershed
Philippines
Coffee, cacao, fruit trees, intercropping, forest fire protection
Colombia
Mango, avocado, citrus, plantain and others
Brazil
Coffee
El Salvador
Dryland reforestation, food security
Côte d’Ivoire
India
Agroforestry, polycropping
Costa Rica
Cameroon
Cacao (linked to projects in Ghana, Côte d’Ivoire, Nigeria)
Pigeon pea and annuals
Indonesia
Cashew, cacao, coffee, fruit trees, agroforestry, sustainable land management (SLM)
Ecuador
Native trees, cacao, coffee, fruit trees
Kenya (United Republic of Tanzania, Ethiopia)
Agropastoralism, agroforestry, tea, fruit trees, woodlots
Peru
Cacao, coffee, marketing
Mozambique
Conservation, agroforestry, fruit trees, pastoral systems
Number of graduates:
○ Not specified
● 0–1000
● 1000–10 000
● 10 000–100 000
● >100 000

Source: FAO. 2022. What have we learned from trees? Three decades of farmer field schools on agroforestry and forestry. Rome.

3.2 Plantation management: on-farm, market-oriented production

The early FFS on agroforestry work was an extension of IPM from rice to fruit trees. In the late 1990s in Indonesia (Mangan and Mangan, 2003) and in Bhutan (van Schoubroeck, 1999), FFS engaged the challenges of IPM in woody bushes and perennials, in particular, estate crops such as cashew, citrus, cocoa, coffee, pepper and tea. Since this work was carried out in a broader context of agricultural production, it is listed under FFS on agroforestry. Several bilateral donor agencies and regional investment centres expressed interest in this activity as a result of a common vision of achieving poverty alleviation among rural people through export-oriented economies (ADB, 2008).

Mangan and Mangan (2003) provide an early account of the challenges they faced in adapting the rice-based IPM experience to trees. In 1997, a joint project financed by the Asian Development

Bank (ADB) and the Indonesian Government applied the FFS approach to address production concerns in cashew, cacao, coffee, pepper and tea. In order to adapt perennial tree crops, it is necessary to adapt the agro-ecosystem analysis and new cultural and material practices. The authors described the main constraints to implementing these methods as organizational and ecological. Organizational constraints included limitations resulting from the nature of the institutions managing the training. Problems of scaling up must prioritize training quality, without which the performance of wide-scale FFS training would fail. The authors found numerous ecological constraints related to the management of fruit tree IPM, in particular, the lack of robust natural enemies for the cocoa pod borer and the coffee berry borer. For training evaluation, the project developed a database that allowed for tracking of learning through FFS, which the authors found led to improvements in both field techniques and the training exercises.

Today, FFS programmes throughout the world continue to work in fruit tree production. Notably, they involve public-private partnerships (PPPs)[4] in coffee and cacao. Long-term, export-oriented PPPs can be found in Central America (Costa Rica, Guatemala, Honduras and Nicaragua), South America (Brazil, Colombia and Ecuador) and sub-Saharan Africa (Cameroon, Ghana, Côte d'Ivoire and Nigeria), as well as in tea in Kenya and beyond.[5]

A number of informants cited outstanding FFS on agroforestry experiences in cacao production on the north coast of Honduras. Beginning in 2008, networks of colleagues, which would become the National Federation of Cacao Producers, established a long-standing programme to address technical and social challenges in the cacao sector (FENAPROCACAHO, 2018). Local volunteer facilitators have played a central role in FFS curriculum design, group formation, the carrying out of FFS activities, and follow-up. This work has benefited from the technical support from Zamorano's IPM programme, the *Fundación Hondureña de Investigación Agrícola* (FHIA, Honduran Foundation for Agriculture Research) and the *Secretaría de Agricultura and Ganaderia* (SAG, Secretary of Agriculture and Livestock), Centro Agronómico Tropical de Investigación y Enseñanza (CATIE, Tropical Agricultural Research and Higher Education Center), as well as international donor agencies, such as Belgium Cooperation, the European Union and MISEREOR.

Based on this experience, the participants identified a series of essential principles for FFS on cacao. First, FFS needed to be based on "learning-by-doing", utilizing farmers' knowledge of and insights on working with fruit trees as a point of departure. Themes unfolded according to the phenological cycle of the crop. The core of each meeting was learning to systematically observe, represent one's ideas and debate during a systematic agroecosystem analysis. Facilitators worked with plantations at different growth stages throughout the community as a natural way to provoke relevant learning: from seed harvest, nurseries, planting, growth, flowering and fruit development, to harvesting, marketing and post-harvest management. Yet, the FFS did not limit learning to the farmer's experience. Facilitators had experience in a series of scientifically tested best practices that they would share along the way. These were not just techniques, but also hard-to-learn environmental insights on soil microbiology, carbon cycles, plant nutrition, disease and IPM, as well as unique market dynamics.

Since 2004, the FFS programme of the Federación Nacional de Productores de Cacao de Honduras (FENAPROCACAHO) in Honduras has emphasized the need for a formal organization in order to gain access to credit and coordinate production, price negotiations and collective sale. Above all, the organizers and participants have emphasized the importance of farmer-led facilitation. These farmer volunteers had to: (i) establish their own agroforestry farm; (ii) recruit, prepare and lead an FFS of 15–20 participants in their community or nearby; (iii) ensure that both women and youth were included; (iv) dedicate 15–20 days to implementing sessions; (v) know how to listen and guide participants through a collective learning experience; and (vi) visit farmers continually during the FFS to provide technical follow-up and keep people motivated.

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[4] In this report, public-private partnerships (PPPs) are applied largely to export-oriented fruit tree production.

[5] For further information, see ASOHOFRUCAL, 2011; Civera, de Colle and Casalegno, 2019; Muilerman and Vellema, 2017; Muilerman, Wigboldus and Leeuwis, 2018; Ochoa, 2017; Waarts *et al.*, 2012.

Ten years into their programme, the participants conducted an internal evaluation to identify the main reasons for the success of FFS on cacao (Box 3). While the programme faced many challenges, this work is a demonstration of the promise of FFS on agroforestry when carefully implemented in terms of building self-esteem and ownership over change processes, filling knowledge gaps, generating income and building social organization. A central challenge was avoiding dependence on donors and project-led development. Aware of this situation, organizations such as the *Asociación Nacional para el Fomento de la Agricultura Ecológica* (ANAFAE, National Association for the Promotion of Agroecology) invested heavily in youth leadership development and supported volunteer promoter networks (see, for example, Espinoza and Melara, 2013).

As summarized in Box 4, PPPs can place unique demands on FFS, interfering with the flexibility required for user-centred approaches. Examples include an overemphasis on good agricultural practices (GAPs), a regime of predetermined management processes. While business and local needs are not necessarily mutually exclusive, PPPs in the coffee, cacao and tea sectors often emphasize the importance of fulfilling business contracts over the priorities of families and their communities. Respondents of the stocktaking survey from Honduras to Kenya

Box 3. Looking back at over a decade of farmer field schools on cacao in Honduras

The reasons for the success of the farmer field schools (FFS) on cacao in Honduras are as follows:

- They are situated in the local reality: They are built on a participatory survey and needs assessment.
- They provide concrete, relevant and easily recognizable learning: The learning is not abstract, but rather, always practical, and participants can see and appreciate their learning.
- They are led by local farmers who practised the intended learning: While technical backstopping was commonly used, the clear leaders of the FFS experience were local farmers who owned a model farm and practised what they preached.
- They strengthen organizations or associations: The learning included the practice of administration and organizational skills that contributed to an existing group of smallholder farmers.
- They use the participants’ farms as action-learning and demonstration sites: Activities did not take place in a classroom, but rather on participants’ farms, which created a dynamic of continual application and pressure to perform before peers.
- They are broadly inclusive: Men, women and youth take part and make decisions.
- They improve productivity: The goal was not just production, but also identifying opportunities to improve a farm’s cost-benefit.
- They introduce new practices in agroforestry: Over time, these practices have contributed the ecological functioning and resilience of participants’ farms.

Source: Based on Varela-Alonzo, R.I. 2020. Guía para implementar Escuelas de Campo en el sector cacao: La experiencia de FENAPROCACAHO impulsando las ECA facilitadas por productores locales. La Ceiba, Honduras, FENAPROCACAHO. 17 pp.

emphasized that for FFS on agroforestry to advance, their empowerment agenda, conflicting interests and power differences need to be carefully managed. Box 4 provides a case-study on PPPs and addresses some details about stakeholder involvement and a more or less fair power relations among actors. Waarts and colleagues (2012) favourably evaluated PPPs in plantation production, and multiple farmer testimonies express sincere appreciation for the financial benefits procured through such initiatives (Box 4).

Similarly, CBF has worked on corporate smallholder partnerships in timber production (see, for example, Nawir *et al.*, 2003). Clearly, smallholder families, both independently and collectively, are increasingly involved in contract arrangements for the establishment and management of planted and managed forests. Concerted attention to the constraints of smallholder families regarding forest management-related issues and the creation of support mechanisms may ensure that this activity indeed contributes to rural livelihoods and well-being, and that success may increase local interest in and support for planted forests. Depending on the local context and priorities, a family, community or association must decide whether or not such business-oriented partnerships ultimately serve their purposes.

Box 4. A public-private partnership for tea export

Research began with a study of a pilot activity involving Lipton and the Kenya Tea Development Agency (KTDA), a project that ran between 2006 and 2008. In the process, the project created demand for the Rainforest Alliance Certification programme, aimed at promoting smallholder tea growers' access to niche markets and enhanced sustainable tea value chains. Under the project framework, two streams of activities were undertaken to prepare farmers to enhance the sustainability of tea practices and to contribute to sustainable tea value chains: farmer field school (FFS) training and Rainforest Alliance training and certification.

Subsequently, the Scalability of Sustainable Tea Value Chain in Kenya project was implemented in Kenya among smallholder tea farmers in the west and east of Rift Valley for two years (2010–2012). A concurrent project, the Kenya Tea Development Agency Sustainable Agriculture Project, involved an integrated and synergistic implementation model, involving a consortium of actors consisting of Rainforest Alliance, KTDA and Unilever. KTDA sought to introduce more effective management services in the tea sector towards more efficient production, processing and marketing of high-quality teas. To achieve this, the project invested in high-potential ventures benefiting smallholder producers, product consumers and shareholders. KTDA aimed to increase the production quantity and quality of the tea without harming the environment. The goal was to train farmers in good agricultural practices, which are useful for increasing product quantity and quality, while preparing them for Rainforest Alliance certification and enhancing the market recognition of responsible farming.

Source: Waarts, Y., Ge, L., Ton, G. & Jansen, D. 2012. *Sustainable tea production in Kenya: Impact assessment of Rainforest Alliance and farmer field school training*. LEI report 2012-043. The Hague, NL, LEI Wageningen UR. 143 pp. https://edepot.wur.nl/214044

3.3 Agroforestry: integrating trees into farms and pastoral systems through farmer field schools

In the 1990s, FAO and its partners began to recognize the importance of paying strategic attention to trees outside forests (TOF) as a means of addressing multiple interests, food security, income generation, biodiversity, sustainable land management (SLM) and climate change mitigation (FAO, 2011). According to the context, TOF can refer to a tree stand of less than 0.5 ha, or less than 10 percent tree cover in a land area, such as trees along roadways and waterways, scattered trees in meadowlands or pastures, and tree stands in agriculture. TOF is usually divided among agroforestry, urban and rural forestry, and other areas, but the focus here is on the FFS on agroforestry, as mentioned in interviews and in the literature.

While many FFS on agroforestry initiatives describe their approach as "agroforestry", they usually involve a relatively limited integration of trees in smallholder farming, such as fruit tree production as a complement to annual crop production. In contrast, FAO considers agroforestry to be part of a more integrated, multi-dimensional approach:[6]

> *Agroforestry is a collective name for land-use systems and technologies where woody and herbaceous perennials (such as trees, shrubs, palms and bamboos as well as grains and oilseeds) are deliberately used on the same land management units as agricultural crops and/or animals, in some form of spatial arrangement or temporal sequence. In agroforestry systems there are both ecological and economical interactions between the different components. Agroforestry can also be defined as a dynamic, ecologically based, natural resource management system that, through the integration of trees on farms and in the agricultural landscape, diversifies and sustains production for increased social, economic and environmental benefits for land users at all levels. In particular, agroforestry is crucial to smallholder farmers and other rural people because it can enhance their food supply, income and health.*

The particular geographic and climate characteristics of large dryland regions of Asia, North Africa and Latin America favour pastoralism over crop cultivation. In these areas, initial studies found that nomadic pastoralists effectively managed natural resources prior to the arrival of permanent villages (Lambton, 1953). Moreover, the low population density of settlements in dryland areas, their remote, itinerant lifestyles, and inherently poor roads and communications infrastructure often render development initiatives with these pastoralists uniquely challenging and costly.

In the mid-1980s, the Japanese International Cooperation Agency (JICA) began to invest in social forestry and extension projects in East Africa, beginning with Kenya (1985) and subsequently to a lesser extent in the United Republic of Tanzania (1991) and Ethiopia (2003). In 2004, JICA and its state partners began to develop "farmer forestry schools". This work primarily involved agro-pastoralists engaged in different aspects of intensified and sustainable livestock, pasture and rangeland management in arid and semi-arid areas (FAO, 2013). Themes included trees for fodder, shade, windbreaks, soil conservation, fuelwood and charcoal production, building and vegetable production (Box 5). Other common forestry themes such as natural forests and water catchments areas, protected areas and industrial forest plantations were not common.

Braun and Duveskog (2008) highlight a number of innovations needed to accommodate the unique demands of remote agro-pastoralists, in particular, the use of farmer-led extension

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[6] FAO. Agroforestry. Definition. www.fao.org/forestry/agroforestry/80338/en

Box 5. Intensifying social forestry in semi-arid areas of East Africa

@Kenya Forest Service

The Intensified Social Forestry Project in Semi-arid Areas in Kenya and later in other parts of East Africa is one of the longest-standing farmer field school (FFS) applications in forestry (JICA, 2003). Established in 2004, this work led by the Kenyan Forestry Department (part of the Ministry of Environment, Natural Resources and Wildlife), the Kenyan Forestry Research Institute and the Japanese International Cooperation Agency (JICA) aimed to develop and intensify farm forestry in dry areas. In part, this strategy has sought to offset pressures on state-protected forests located in medium and high rainfall areas. In particular, the project has sought to help farmers manage the numerous woodlands, bushlands and wooded grasslands in arid and semi-arid areas. Later, this work was extended to the United Republic of Tanzania and Ethiopia.

In this project, 'social forestry' was understood as the practice of forestry outside of protected areas that included farm forestry, community forestry and urban forestry, but mostly focused on rural farm applications such as:

- seedling production by farmers and farmer groups;
- tree planting within the farmlands in configurations, such as woodlots, boundary planting, homestead planting, windbreaks, isolated trees within farms or pasturelands, and trees planted in degraded areas for rehabilitation;
- production of non-wood forest products; and
- soil fertility management using tree biomass.

Through the application of FFS on social forestry, the partners worked to enable farmers and their communities to increase the stock of trees in private farms and in communal pasturelands as a means of reducing the deficit of wood and easing the pressure on protected areas.

and experimentation. The farmer-to-farmer extension method has been important for effectively drawing on experiences of earlier field schools and compensating for the resource limitations of national extension programmes. The Kenyan Forestry Service and the Ministry of Agriculture implemented a joint management system as well as a range of innovative farmer-led monitoring and evaluation tools.

In Latin America, only a few FFS applications focused on agroforestry, including a large Mesoamerican project led by CATIE (Gutiérrez-Montes *et al.*, 2012) and a pilot FFS in Ecuador (Ochoa, 2005). FFS on agroforestry embarks on a variety of relevant themes (Box 6). According to the precepts of the adult learning approach in FFS, *how* something is taught can be more important than *what* is taught. The CATIE-led schools explicitly seek to apply the adult learning methodology of FFS. Overall, the objective of CATIE's FFS was (Gutiérrez-Montes, 2012: 16) to:

> *...create a learning environment where participants learn, discover, share and apply more and better knowledge and abilities for the improvement of their fields and farms, and in this way, improve the welfare of the family and the community.*

Not unlike the PPPs for fruit tree and tea production, this approach implies that there is better knowledge and technology, which will bring about needed changes in farming and rural livelihoods.

Based on Aguilar and Prins (2009), CATIE's FFS on agroforestry differed from other FFS applications. In the FFS on agroforestry reviewed, content ranged from coffee and cacao production to improvement of degraded pastures. The focus was not just on the farm, but also on broader landscape or territorial development. The project selected and trained facilitators who were charged with recruiting participants and bringing them together for monthly sessions. In addition, the project organized two intensive workshops. Instead of meeting every week or two, as practised in FFS for annual crops, CATIE's FFS met during critical moments in the phenological stages of the reference perennial crop or animal of interest (coffee or cacao trees, pasture, pigs), or agroecosystem management (Table 2).

Gutiérrez-Montes *et al.* (2012) find that the complexity of FFS on agroforestry can demand strong backstopping from technical experts in learning assessment and design, as well as different aspects of agronomy, animal science, forestry and gender. The broadness of themes, commonly unfolding across multiple tree species, post-harvest management, gender and state policy, made it difficult to delve deeply into basic biological processes for each. This also created difficulty in training and supporting volunteer promoters.

Box 6. Common themes of farmer field schools on agroforestry

Facilitators of farmer field schools (FFS) on agroforestry in Latin America have organized activities around a diversity of special themes, including:

- Composting/organic amendments
- Soil conservation/farm design
- Inter-cropping
- Seed selection
- Nursery production
- Transplanting
- Grafting
- Pruning and light management
- Timber production
- Chain saw use and maintenance
- Integrated management of fruit pests
- Biofertilizers/plant juices
- Botanical pesticides (e.g. *Gliricidia* spp.)
- Live fencing and other barriers
- Contour barriers
- Green manures/covercrops
- Forage and fodder production
- Cost-benefit analysis.

Table 2. The differences between conventional farmer field schools (FFS) on annual crop production and CATIE's FFS on agroforestry in Mesoamerica

Criteria	Conventional FFS on annual crops	CATIE's FFS on agroforestry
Contribution of technical experts	Specialists support a needs assessment, curriculum development, and technical back-stopping of a facilitator.	Specialists lead the design of FFS curriculum, the development of training materials and the training of local promoters in workshops. When possible, they support promoters in the organization and implementation of FFS.
Facilitation	This engages a professional or an outstanding FFS graduate trained to organize and run a field school in their community and in surrounding villages.	The project's technical staff recruit promoters from local families at the beginning of the initiative. Promoters primarily lead FFS sessions, with occasional support visits and coaching or mentoring by technicians.
Number or participants	20–25 volunteers (usually adults).	Representatives from 7 to 10 families. Commonly, multiple members of the family take part, including children.
Duration	The duration is 16–20 weekly or fortnightly sessions over a 4–6-month growing season (depending on the crop).	The entire FFS on agroecology takes place across 20 sessions distributed over two years.
Activities	Sessions last about four hours and include: a field visit, agroecosystem analysis, discovery exercise of a special topic, group dynamics, and a report on experiments.	Activities consist of two modules of 10 sessions and two workshops and demonstration plots. The training guides are iterative in that they allow participants to continually test and revise content.
Content	At inception, the facilitators guide the farmers in participatory needs assessment. Together, they map cultural practices and learning priorities across the phenological cycle of crops.	Technical experts conduct participatory needs assessments with communities to determine capacity-building needs. Technical themes emphasize the management of trees (grafting, pruning) as well as gender (primarily labour demands of women).
Experimentation	This includes both facilitator-led learning experiments and participant-led, open-ended experiments.	Emphasis is placed on participatory technology development, both on the individual farm and on the collective learning plot. When funds are available, the project finances experiments with USD 50--100 in seed money per family.

Source: Based on Aguilar, A. & Prins, C. 2009. Compartiendo experiencias del CATIE en la implementación del enfoque ECAS: como mejorar su calidad, cobertura e impacto? Memorias del Taller, 24–25 September. Turrialba, Costa Rica, CATIE.

Working in agroforestry in the highland Andes in Ecuador, the Community-based Natural Resource Management Network (MACRENA) sought to keep its application of field schools relatively simple while carefully respecting the open-ended learning of participants (Ochoa, 2005). Similarly, MACRENA aspired to link the FFS with leadership development. While its work in Ilaló was not part of a longer-term project, the value of promoting creativity, self-esteem and empowerment in and through FFS eventually led to the opening up of other transformative opportunities for the participants.

From March to September 2005, the Coordinator of MACRENA and a graduate of FFS on IPM in Ecuador adapted the discovery learning approach for agroforestry. He led one of the first FFS specifically on agroforestry in Ecuador, involving 19 participants from the village of La Merced, located on the flanks of the Ilaló Volcano, about one hour from the capital city of Quito.

The FFS included a total of 24 sessions of 4–8 hours each over a period of about eight months, including a field day and graduation. To compensate for the life-cycle of perennials, the facilitator employed a chrono-sequencing design. This allowed participants to work on trees at different stages of their phenology – seedling, transplanting, pruning, and fruit and wood harvesting. Since there was a carpenter in the group, a wood-working session was added. Special themes included soil conservation, composting, seed harvesting and selection, the establishment of nurseries, agroforestry design and management, IPM, fruit preservation and canning, fuelwood and timber harvesting. Experiments explored nursery media, fertilization practices, pest-beneficial interactions and disease management in fruit trees, grafting and pruning, and a financial analysis of timber production. Through its learning activities, the field school's nursery produced 10 000 trees that were subsequently planted in the participant's respective properties.

Not unlike the catalytic experience, which at times was enabled by IPM, this particular forestry pilot sparked an unusual trajectory of activity, leading to previously unimagined leadership development, social organization and concerted action that travelled well beyond the boundaries of the village (see Box 7). These people played an important role in Ilaló Verde, a loose network of nearly 2 000 families that live in and around the volcano and who are interested in protecting 6 900 ha of the volcano. FFS graduates argued that the Ilaló Verde conservation initiative would not have been possible without the success of the FFS on agroforestry pilot that took place a decade earlier.

3.4 Watershed and landscape management

In Southeast Asia, the FFS approach was applied to integrated production and landscape management. In the late 2000s, FAO began to emphasize integrated production, opening up the opportunity to move beyond the plot and engage rice systems in a broader ecosystem. Often built on the experience of earlier FFS-IPM programmes, the integrated landscape approach was applied in places such as Indonesia, Myanmar, Viet Nam, Thailand and the Philippines.

Studies have found that the application of the FFS approach to complex systems – polycultures as well as multifunctional landscapes – can be successful (Bentley, 1989 and 1991; Sherwood, 1997; FAO, 2002). After years of applying FFS at the farm plot, field and community levels, in the 2000s, development practitioners began to apply it to landscape-level concerns, such as regional pest problems, watershed management, hydric cycles and climate change. For farmers, addressing these important concepts, albeit conceptually distant, involved introducing new sets of actors and dilemmas to the FFS action-learning experience. Associated abstractions posed new challenges to the time-proven FFS traditions of contextual grounding, practicality, self-directed learning and farmer-led experimentation. While from a scientific perspective,

Box 7. The Community-based Natural Resource Management Network's (MACRENA) pilot farmer field school on agroforestry

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In 2005, neighbours of La Merced in the highlands of Ecuador became interested in reforesting their homesteads and neighbourhood, so they invited a facilitator from the Community-based Natural Resource Management Network (MACRENA), to help design and implement an FFS on agroforestry. Trained through an intensive, 400-hour FFS training of trainers' course on integrated pest management (IPM), the facilitator was knowledgeable of FFS. Despite extensive experience as an extension worker for FAO's Community Forestry Programme, he did not have experience in applying FFS to forestry and started a pilot.

Nineteen participants from different parts of La Merced worked with the facilitator to conduct a participatory needs assessment and to design a curriculum. In all, the FFS involved 24 sessions over a period of eight months, including a field visit to an outstanding agroforestry farmer, a field day and graduation.

After taking part in the field day, the municipality of Quito financed a project called 'Greening Ilaló', which led to over 30 community-run field schools on agroforestry in surrounding neighbourhoods and villages. With additional support from Rotary International, this activity spawned a series of projects in other areas of interest, including water harvesting, ecological bee management, community food baskets, and smallholder savings and credit systems. With the help of a university geography student, community members worked with an elementary school to create a three-dimensional map of their side of the volcano, identifying vulnerable families due to food insecurity, landslides, social disparity and conflict. Eventually, this work contributed to a volcano-wide management plan, leading to the establishment of a series of protection zones that cover over 6 900 ha.

Source: M. Paredes and S. Sherwood, personal communication, 2021.

understanding and acting at these scales may arguably be highly relevant to a community, it might be challenging for individual families to relate to and interact with such concepts based on their experience. As a result, an immediate challenge emerged in applying FFS to an off-farm dynamic: how to make participants feel the need and desire to become involved. Relevance certainly is a challenge for FFS that intend to tackle the long-term considerations of trees and forests in agriculture, food and natural resource management.

Box 8. Managing forests with the community through farmer field schools in Indonesia

In 2001, Indonesia's state forestry corporation established a policy of *Pengelolaan Hutan Bersama Masyarakat* (PHBM, Managing Forests with the Community), which provided communities living within or adjacent to state forest lands with clear access rights and management responsibilities. This created the need for communities to be able to represent their interests and negotiate agreements with forest stakeholders, be they from other communities, private enterprise or the state.

PHBM farmer field schools (FFS) were organized to help farmers build their individual and collective capacities in forest management. The planning/design group determined that it would be best to begin by focusing on upland agroforestry management, located within the broader context of integrated watershed management. The basic objective of the FFS on agroforestry was to provide families and communities living in the upland region with the knowledge and skills necessary to adopt conservation farming practices for their traditional agroforestry garden (known as a *kebun*) in order to conserve and protect water supplies (both surface and recharge). An obvious starting point was the farm family's need to reliably increase the income gained from the *kebun* by increasing the productivity of land and labour.

From 2004 to 2010, the United States Agency for International Development (USAID) financed the Environment Services Program in Indonesia, a collaborative project implemented by government agencies, non-governmental organizations (NGOs) and community organizations. The primary objective was to strengthen watershed management and provide clean drinking water from 'ridge to reef'. The populations of the upper region worked on forest rehabilitation and conservation; and graduates from FFS-integrated pest management (IPM) organized the Farmer Initiative for Ecological Literacy and Democracy (FIELD) as part of a regional FIELD Alliance dedicated to rural capacity building. The FIELD initiative together with other partners supported upland communities in rehabilitating and conserving the forest that provides fresh water to lowland populations, as well as clean water delivery to lowland, urban and peri-urban villages.

According to the implementers, as with rice farming, ecologically sound agroforestry was more stable and profitable than unsustainable farming practices. Good soil management practices, including erosion control, the use of organic fertilizers and intercropping that combines medium- and long-term crop varieties with seasonal crops, enhance the productivity and resilience of dryland agriculture systems.

The PHBM FFS covered the following content:

- comprehension of *wengkon* (i.e. multiple cropping or planting crops between young timber trees in the state forests);
- analysis of household consumption needs;
- analysis of forest farming input needs;
- inventory and mapping of *wengkon;*
- canopy analysis;
- harvest analysis – seasonal and long-term crops;
- forest farmer income analysis;
- risk analysis;
- economic and ecological analysis of individual farmers' *wengkon* plots;
- understanding of PHBM;
- individual *wengkon* planning to maximize benefit;
- follow-up action plans; and
- *wengkon* field school field day.

According to Thorburn (2012), PHBM that involved FFS were uniquely successful in advancing the agenda of integrated watershed management and biodiversity conservation. In five years, they helped to set up 477 community groups, draft 44 management plans, plant nearly 5 million trees, and rehabilitate 52,561 ha of land. The project identified the involvement of women as particularly strategic due to their deep knowledge of plants, cooking and the family diet. Prior to the FFS, women provided much of the labour for the agroforestry *wengkon* system, but were not usually involved in its design and decision-making over management. As a result of their involvement in watershed-level protection, FFS actors were able to make contacts with stakeholders lower in the watershed, which led to follow-up projects in such areas as biogas production, cut-and-carry livestock feeding systems, and coffee planting.

Sources: Thorburn, C. 2012. Farmer field schools for integrated watershed management. *Development in Practice*, 22(1): 3–17. www.jstor.org/stable/41413018; and Wienarto, N., Thorburn, C.C., Pontius, J.C. & Cahyana, W. 2012. Agro-forestry Field School of the USAID Environmental Services Program. *Agro-forestry Field School of the USAID Environmental Services Program*. p. 13. Paper presented at Community-based Forest Management Workshop, 22 February 2012, Monash Sustainability Institute, University of Palangkaraya, Indonesia. www.academia.edu/5177813/Agro_forestry_Field_School_of_the_USAID_Environmental_Services_Program

During interviews, long-term FFS pioneers working in Southeast Asia agreed that the approach could be successfully applied to new levels of scale. Khumairoh *et al.* (2019) confirm that the FFS approach applied to relatively long-term issues of complex systems management can contribute to innovations at multiple sites, from the farm to the landscape, and from the present to the future. Consistent with the early work of Mangan and Mangan (2003) in estate crops, it is important that the agroecosystem analysis be adjusted to new contexts in order to serve as an instrument for continual and collective observation, reflection and concerted action (see Box 1). The analysis also demanded continual application of the FFS at home, in the neighbourhood, and in the watershed. The challenge here was to sustain participants' attention, sense of connection, and enthusiasm across the sessions. This demanded investment in continual processes of interaction and follow-up, such as cross-visits, field trips, and long-distance media, for example, radio programmes.

According to FAO staff working in Southeast Asia, one very important benefit from applying the FFS approach to larger-scale issues is that it enables farmers and rural communities, scientists, industry professionals and government actors to meet and establish direct relationships (Box 8). As a result of moving into new areas of complexity, FFS have attracted the interest of a new community of actors, in particular the scientists, policymakers and donors working in the environmental sector. They argued that this has led to greater understanding of stakeholder needs and has initiated unforeseen collaborations outside of the FFS environment, such as through new producer contracts, and for the construction of a bridge, an irrigation project, improved municipal and regional planning, and priority setting. With regard to the challenges of climate change mitigation, it has helped rural families to become central actors in carbon sequestration activities and projects.

3.5 Soil conservation, conservation agriculture and climate change

In response to growing public concern over climate change in the last decade, with the arrival of new partners such as the United Nations Environment Programme (UNEP), the Global Environment Facility and Green Climate Fund, among many others, FFS applications have expanded to address issues concerning climate change adaptation and mitigation in agriculture, fisheries, forestry and pasture management, as well as in integrated systems. The

Box 9. The Transboundary Agro-Ecosystem Management Project for the Kagera River Basin

Beginning in 2009, the Global Environment Facility (GEF), FAO and the Governments of Burundi, Rwanda, United Republic of Tanzania and Uganda worked with smallholder farmers in 21 districts to test and adapt sustainable land management (SLM) practices (crop, livestock, soil, water) and integrated production systems for the multiple purposes of restoration of degraded lands, carbon sequestration and adaptation to climate change, agro-biodiversity conservation and sustainable use, and increased agricultural production.

The project was designed to demonstrate how bottom-up approaches with farming communities could restore degraded land and provide a basis for SLM across the diverse agroecosystems in the basin of the Kagera River. Communities conducted resource diagnostics and visioning exercises regarding land management and on livehoods, which were followed by action plans. The project ran farmer field schools (FFS) for learning, sharing and adapting farm and community-level SLM practices. Watershed catchment committees were organized for governance and the expansion of uptake, among others.

Throughout the project, the FFS focused on land rehabilitation, soil fertility enhancement, crop-livestock integration, horticultural production, and climate change adaptation at the farm and landscape levels, including aspects of forestry and agroforestry. Local experts identified regionally specific best practices to be included in the FFS curriculum and adaptive management in farmer-led experimentation. These included 'win-win' production and environmental protection practices to enhance soil health, rainwater catchment and waterway recovery, diversified yields and resilient livelihoods and ecosystems. Five years into the project, FAO organized a writing workshop to capture lessons learned from the SLM work across Kagera-Tamp.

Highlights from the FFS experience included the importance of soil composting and the creation of networks and organizations for broader influence among rural families. In addition, the project highlights the importance of strong local institutions and community-based organizations in landscape management that are backed up by an enabling policy environment for building enhanced resilience to climate change and food and nutritional security.

Source: FAO. 2017. *Sustainable Land Management (SLM) in practice in the Kagera Basin. Lessons learned for scaling up at landscape level – Results of the Kagera Transboundary Agro-ecosystem Management Project* (Kagera-TAMP). Rome. 440 pp. www.fao.org/3/i6085e/i6085e.pdf

FFS work in soil conservation, conservation agriculture and climate change emphasizes the importance of further integrating trees in agriculture, be it for erosion control, increased water-holding capacity, soil fertility management, above- and below-ground biomass management for both improving nutritional and food security, or re-carbonizing soils. Examples include FFS work in such diverse locations as Belize (CATIE) (Gutiérrez-Montes *et al.*, 2012), Jamaica (Agricultural Cooperative Development International/Volunteers in Overseas Cooperative Assistance) (Rhiney and Tomlinson, 2017), Ethiopia, United Republic of Tanzania and Kenya (CIFOR), Myanmar (FAO, 2019), Viet Nam, Cambodia and the Philippines (Chandra *et al.*, 2017).

In terms of scale, one of the most prominent initiatives has been the Transboundary Agro-Ecosystem Management Project for the Kagera River Basin (Kagera-TAMP) (Box 9). This included applications in rainwater harvesting and micro-irrigation; soil conservation and climate-smart agriculture (CSA), and in pasture and landscape management. Trees, forestry and protected areas appeared in FFS applications but were secondary. Programmes commonly promoted trees and other aspects of forestry, but respondents from different FFS programmes felt that there was opportunity to increase the profile of perennials in family farming for defining borders, improving soil conservation, agrobiodiversity, animal fodder and fruit tree production, and for mitigating climate change.

Building on earlier work in community-managed sustainable agriculture, in 2016 the Government of Andhra Pradesh in India, through its organization Rythu Sadhikara Samstha, began to carry out the climate change-resilient Andhra Pradesh Community-managed Natural Farming Programme (APCNF).[7] The state-level programme uses agroecology as a means of advancing food security, farmers' income and nutrition, and the regeneration of agro-ecosystems. Based on community-based natural farming, regenerative agriculture principles seek to strengthen the soil biome and plant rhizosphere through such practices as microbial seed coating, organic amendments, cover crops, limited tillage, and constant ground cover and overall crop-livestock-tree integration. In 2018, with support from FAO, the programme introduced FFS, gradually training 125 young facilitators and 30 master trainers throughout the state. While this approach has favoured quick-term annuals, it strongly promoted: intensive polycropping and various multilayer agro-forestry models including fruit trees and other perennials, cereals and vegetable crops, legumes, creepers and root crops; pre-monsoon dry sowing in dry areas; and the concept of "365-day green cover" with associations and successions (Galeb *et al.*, 2021). External assessments describe FFS as a critical avenue for farmer-to-farmer knowledge dissemination and the demonstration of the benefits of natural farming. From an initial focus on farmers adopting the prescribed "packages of practices", FFS has helped the programme evolve to value farmer-led experimentation and co-construction of solutions with farmers.

3.6 Community forestry

During consultations, few applications of FFS principles were applied for the collective management of natural forests. The work in Kenya largely focused on on-farm applications instead of community forestry. Nevertheless, the work with forest management learning groups in Nepal and Viet Nam applied FFS to community forestry, and further examination of this experience can be useful in understanding the possibilities in this area (Singh, 2003; Miagostovich, 2004; Westendorp, 2012).

Nepalese hill people generally have a profound knowledge of the forest and the utilization of trees on farms (Nightingale, 2005), and their taxonomy covers countless tree and bush species. They also have a profound understanding of birds and mammals, including their mating and feeding habits and migration patterns. However, they may have less specific knowledge of ecology, including species interaction, population thresholds and sustainability. As summarized by Singh (2003), in the farmers' forest management schools, experienced farmers and technical experts from the Ministry of Forestry teamed up to learn about adult education, course design and facilitation, as well as how to identify knowledge gaps and conduct experiments focused on coppice management. They then worked together to recruit and implement field schools; in this case, the focus was not on teaching new information or techniques, but rather on how to encourage groups of farmers to talk about their experience, to analyse alternative management approaches, and to conduct experiments.

Interviewees pointed out that while community forestry pioneered people-centring in project design, especially with regard to forest rights and ownership, there was a lack of support for local knowledge production. Based on his study of an early trial of FFS with forest user groups (FUGs) in Nepal, Singh (2003) documented this situation and concluded that the primary value added of FFS in community forestry was the placing of users at the centre of learning.

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[7] See https://apcnf.in

In particular, he highlighted the importance of creating a systematic approach for bringing together formally trained forestry professionals and farmers in joint action-learning as well as training local farmers as agents of change.

Although Nepal had established an unusual legal framework at the turn of the century that effectively handed over forestry management to communities, a number of weaknesses were identified, particularly services provided to communities and FUGS, and a lack of community agency. Singh (2003) cited the lack of a supportive, collaborative forestry services that could educate forest officials on the value of FFS, the provision of externally based facilitation, and of logistic and continued follow-up support to community plans and emergent initiatives. With regard to community forest users, in addition to difficulties with language and literacy, the Nepalese experience sheds light on the need to address social exclusion and mainstream women, girls and other marginalized segments of a community. In addition, community FUGs in the Amazon, Southeast Asia, West Africa and elsewhere have generally struggled to represent and defend their interests against logging, mining and other large-scale resource extraction activities, posing long-term challenges for knowledge-based approaches.

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4. LESSONS FROM THE FARMER FIELD SCHOOL APPROACH APPLIED IN FORESTRY AND AGROFORESTRY-RELATED THEMES

Over time, FFS experience has taken ecological literacy beyond field crops and the farm, for example, to fruit tree production in Bhutan (van Schoubroeck, 1999), soil conservation in India (Tripathi *et al.,* 2018) and landscape management in Indonesia (Thorburg, 2012). Rural development initiatives in Bolivia and Ecuador worked with teams of FFS graduates on “katalysis”, an action-learning approach in agroforestry to help farmers better understand their experience with global warming and develop a concerted response to it. Winarto *et al.* (2017) report that, in Indonesia, farmers/groups formed “science field shops” involving farmers, extension agents and scientists in joint learning in agriculture-relevant meteorology. This work helped participants adapt to climate change through experimentation in agronomic practices, such as biomass accumulation.

4.1 The goal of farmer field schools: farmers become the experts

During interviews and in the literature review, questions generally arose over the degree of adherence of FFS on agroforestry and forestry-like applications to the original designs of FFS. It may therefore be necessary to briefly revisit some of the central pedagogical elements of FFS, in particular with regard to the self-empowerment purposes as inspired by the work of educators such as Paulo Freire (1973) and John Dewey (1938), and summarized in FAO (2002). Kevin Gallagher (2003) encapsulated the key elements of the FFS design (Box 10). These included a self-directed,

Box 10. Key elements of the farmer field school design

- Non-formal adult education – Adults have substantial life experience and are largely independent, self-directed learners.
- Interactive group learning – People learn best in groups, where they can interact and exchange ideas based on their diverse life experiences.
- Content linked to crop and animal stages/life cycle – Farmers address technical content immediately as it emerges with the development of the crop or animal, and the labour and cultural activities associated with its production.
- The field is the best place for learning – Rural people prefer applied knowledge and learn best during hands-on interaction with their crops and animals in the field.
- Basic scientific concepts – Every farm and every season is different; farmers need to manage general concepts and apply them to specific local contexts.
- Continual learning and experimentation – Agriculture is a highly dynamic enterprise, hence, farmers never stop learning and innovating.
- Farmers become experts – Participants become critical thinkers, highly capable of independently solving problems and taking on the challenges of their agricultural development.

Source: Based on Gallagher, K. 2003. Fundamental elements of a farmer field school. *LEISA Magazine*, 5(6): 5–6.

adult learning methodology, a group experience, practical learning linked to the phenological stages of the crop or animal, and the introduction of basic biological concepts. In addition, farmers developed their own expertise.

Jules Pretty (1995) summed up the FFS ideal of "user-centring", where participants take part in needs assessment and determine the curriculum, where experience becomes the teacher, and where learning is free, open-ended and evolutionary (Box 10). How well do the different forestry applications of FFS stack up against the original FFS elements? Do they meet the minimal standard of farmers becoming experts in ecological literacy and applied problem-solving?

Box 11. The farmer field school learning process

1. What is relevant and meaningful is decided by the learner and must be discovered by him/her. Learning flourishes in a situation in which teaching is seen as a facilitating process that assists learners in exploring and discovering the personal meaning of events for them.
2. Learning is a consequence of experience. Learners become responsible when they have assumed responsibility and experienced success.
3. Cooperative approaches are enabling. As learners invest in collaborative group approaches, they develop a better sense of their own worth.
4. Learning is an evolutionary process and is characterized by free and open communication, confrontation, acceptance, respect and the right to make mistakes.
5. Everyone's experience of reality is unique. As learners become more aware of how they learn and solve problems, they can refine and modify their own styles of learning and action.

Source: Based on Pretty, J. 1995. *Regenerating Agriculture: Policies and practice for sustainability and self-reliance*. Washington, D.C., Joseph Henry Press. 336 pp. https://doi.org/10.17226/4930

4.2 The performance of farmer field schools on forestry and agroforestry

The author of this stocktaking reached the reported findings following 30 interviews and subsequent literature. He asked interviewees to comment on the merits of applying the FFS approach to different thematic fields against FFS implementation criteria established by Gallagher (2003), as summarized in Box 10. Respondents familiar with FFS implementation commented on the overall performance of FFS applied to different themes (plantation management, agroforestry, landscape restoration, climate change and community forestry). The performance ratings were: 1 (low or under FFS standards), 2 (medium or meeting standards) and 3 (high standards). Not all five FFS thematic applications were present in every context. A low score in "farmers become experts", for example, indicates that FFS participants did not firmly control the experimentation process. A medium score indicates that farmers chose topics, designed experiments, analysed results, and reached conclusions. A high score indicates that farmers showed an unusual degree of independence, ownership and creativity over the experimentation process, for example, in applying learned experimentation approaches to new questions or establishing a research group that went beyond the FFS campaign. Table 3 reports averages. Without being able to observe an FFS in real time, the author compared findings with a review of available texts. This assessment is not exhaustive or definitive. The table is a first attempt to identify FFS applications' comparative strengths and weaknesses across thematic areas. Further study is needed to verify and unpack performance homogeneity and heterogeneity within and between contexts to reach more definitive conclusions.

Table 3. Comparative strengths and weaknesses of the application of the farmer field schools approach to different forestry and agroforestry themes*

Criteria	Plantation management	Agroforestry	Landscape restoration	Climate change	Community forestry
Non-formal adult learning	High	High	Medium	Medium	Medium
Interactive group learning	High	High	High	Medium	Medium
Content linked to life-stages and cycles	High	High	Low	Low	Medium
Field-based learning	High	Medium	Medium	Low	Medium
Basic scientific concepts	Medium	Medium	Low	Low	Low
Open-ended learning and experimentation	Medium	Medium	Low	Low	Low
Farmers become experts	Medium	Medium	Low	Low	Low

* This assessment is neither exhaustive nor definitive. The table is a first attempt to identify FFS applications' comparative strengths and weaknesses across thematic areas. Further study is needed to verify and unpack performance homogeneity and heterogeneity within and between contexts to reach more definitive conclusions.

According to interviews and as reflected in the available literature, FFS on plantation management and agroforestry adhered most closely to the original FFS designs. As reported in van Schoubroek (1999) in Bhutan, and in Mangan and Mangan (2003) in Indonesia, initial FFS for citrus as well as estate crops (e.g. cashew, cocoa, coffee, pepper and tea) focused heavily on IPM and sought to directly adapt the approach developed in rice. This included the use of an agroecosystem analysis and regular management of decisions based on regular observations of pests and natural enemies, but with adjustments made to compensate for different phenological cycles. For example, the time period of systematic group observation varied among bushes (every two weeks), perennial vines (once or twice each month) and trees (every two or three months). According to the literature on the work in Bhutan and Indonesia, the classic agroecosystem approach was limited due to the difficulties in observing tree canopies.

Mangan and Mangan (2003) faced difficulties finding precise insect and disease information to support FFS plantation. For example, while information on the life cycle of common pests and interactions with beneficial organisms was readily available for rice crops, they often had to start from zero for tree crops. They called for conducting greater research on tree pests as well as improving the application of agroecosystem analysis to trees.

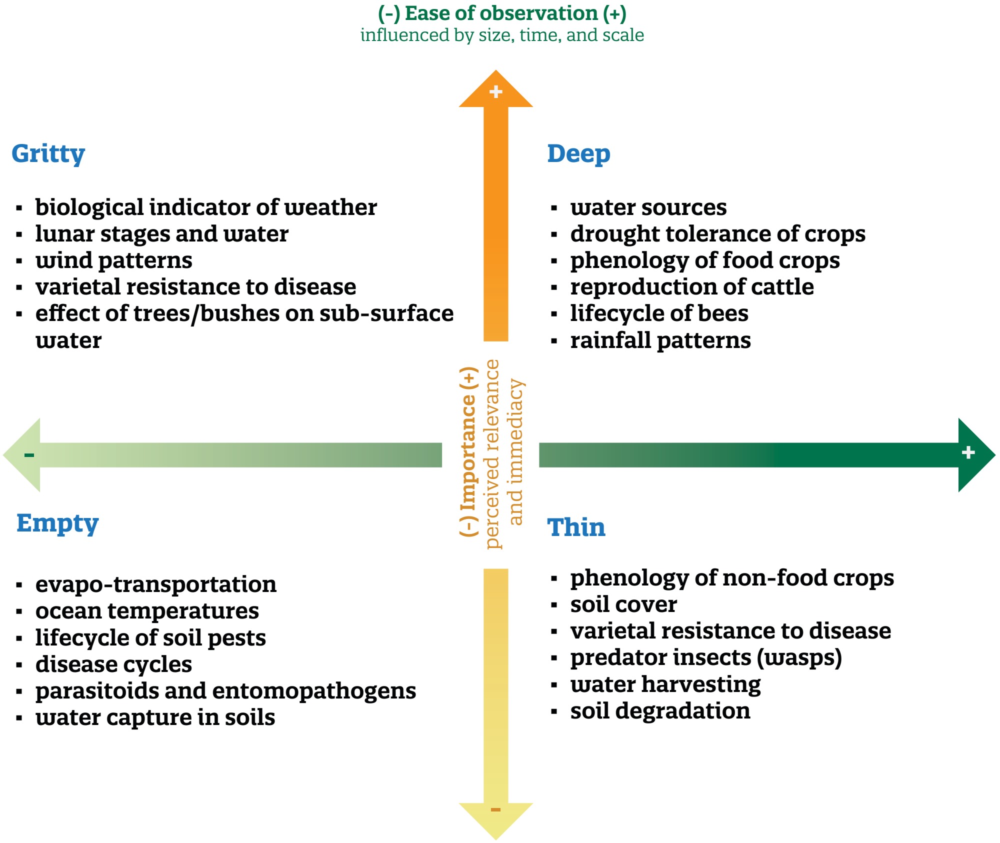
Overall, the FFS approach applied to perennials faced organizational challenges (e.g. linking FFS temporal and spatial dynamics with those of longer and larger living life-forms) and ecological challenges (as scale and complexity expanded). Organizational constraints were linked to the inherent time, geographic, and even psychological distance between people and the lengthy time-frame of perennials. Whereas people observe the complete life cycle of annual crops such as rice, which lasts about four months, they observe the growth of trees over their lifetime. The slow evolution of tree phenology, which can take place over decades and even centuries, made trees and forests difficult to observe during the brief period of an FFS. Action-learning groups have found it helpful for learning purposes to conduct cross-visits, for example, to learn about mature tree management in different farms, experiences in reforested areas, and ecosystems in natural landscapes. Working with FFS on fruit trees and woodlots was not as difficult as working with FFS on forests in the context of a watershed, landscape or region, or, even a global context, such as climate change.

Beginning in the 2000s, the FFS approach was increasingly applied to the framing of cross-field and off-farm interactions that are becoming more abstract, including cropping systems, hydric cycles, landscapes, watersheds, regions and even climate. For humans, each space can introduce a new set of agents, relationships and dilemmas that merit observation, abstraction, planning and concerted action. Although from a scientific perspective, activities at other locations arguably may be highly relevant to a rural family or a community, they can be perceived as physically or temporally distant and abstract. Relevance is certainly a challenge for FFS that aim to tackle the long-term considerations of trees and forests in agriculture, food and natural resource management.

Based on document analysis and interviews, an occasional qualitative difference was identified between how field schools focusing on global challenges were designed and implemented, and the original, field-focused FFS in terms of successfully placing users at the centre of curriculum development, process management and technology development (see modalities of knowledge production in section 2.1. and Annex 2). FFS work in CSA and community forestry management found greater difficulties in applying key FFS elements (see Box 10). There continued to be organizational and ecological constraints linked to institutional dynamics that emerged when working at a larger geographic scale. Pastoralists lived in smaller, more mobile communities, and trees were used for fodder or shade, and had less immediate economic value. This situation effectively disconnected them from modern society organized around commercial markets. Scientists who engaged in landscape- and climate-related issues were working with large datasets and models, which made their work more abstract than when working on annual crops. When tasked with conducting a field school at the watershed level, these professionals resorted to their expertise, i.e. abstract modelling and statistically determined best practice. Inevitably, this led to less participatory, externally driven learning dynamics. These experiences highlight the challenge in linking intensive farm- and community-level learning with what has become a global environmental phenomenon such as mass soil degradation, biodiversity decline and climate change.

It emerged from studies that it was inherently difficult to apply the FFS principles to complex systems – from the infinitely small (i.e. soil microbiology) to polycultures and multifunctional landscapes. In addition, from the start, FFS have been designed to enable farmers to understand processes that are normally difficult to observe due to their time and space scales (too large or too small), such as interactions in the food chain for IPM (Bentley, 1989 and 1991; Sherwood, 1997; FAO, 2002).Sherwood and Bentley (2009) found that "ease of observation" and "perceived relevance" influence local knowledge in agriculture and climate (Figure 2). Knowledge tends to be more in-depth on topics that are both important to local people and easy for them to observe, such as local weather prediction, for example, on whether the rains will come early or not, or whether it will be a cold or warm year. From such perspective, there tends to be gaps in knowledge on topics that are both difficult to observe and of low perceived significance. For example, highland Andean farmers know little about sea surface temperatures and associated relationships with local weather patterns. As a result, they usually lack local explanations, nuanced classifications or even words to describe these topics and phenomena. In addition, rural people tend to have rough explanations both for experiences that are difficult to observe but that are perceived as highly important, such as global wind patterns, lunar stages and disease resistance in certain varieties, and for phenomena that are relatively easy to observe but considered not very important, such as soil erosion and the phenology of non-food crops or insects of little perceived usefulness, such as wasps.

Figure 2. Strengths and weaknesses of farmers' local knowledge associated with agriculture and climate change


(-) Ease of observation (+)
influenced by size, time, and scale
+
Gritty
▪ biological indicator of weather
▪ lunar stages and water
▪ wind patterns
▪ varietal resistance to disease
▪ effect of trees/bushes on sub-surface water
Deep
▪ water sources
▪ drought tolerance of crops
▪ phenology of food crops
▪ reproduction of cattle
▪ lifecycle of bees
▪ rainfall patterns
-
(-) Importance (+)
perceived relevance and immediacy
+
Empty
▪ evapo-transportation
▪ ocean temperatures
▪ lifecycle of soil pests
▪ disease cycles
▪ parasitoids and entomopathogens
▪ water capture in soils
Thin
▪ phenology of non-food crops
▪ soil cover
▪ varietal resistance to disease
▪ predator insects (wasps)
▪ water harvesting
▪ soil degradation
-

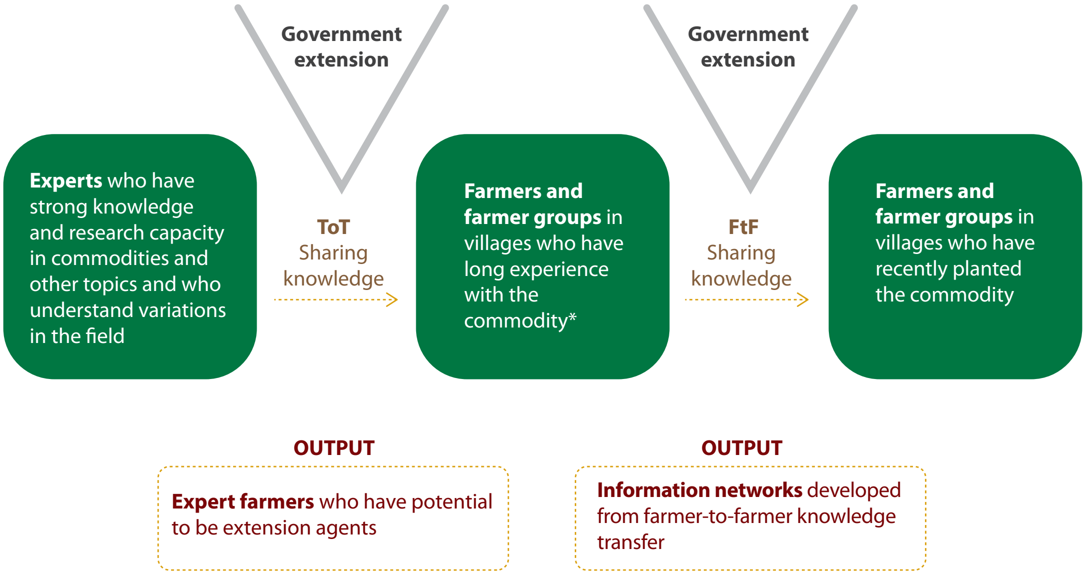
Source: Sherwood, S. & Bentley, J.W. 2009. Katalysis: Andean farmers adapt to climate change. Participatory Learning and Action, Special edition on Community-based Adaptation to Climate Change, pp. 65–75. London, UK., International Institute on Environment and Development.

Developed to enable user-defined, people-centred development, by its design, the FFS approach does not fit well within conventional extension and development institutions. As a result, when integrated in existing extension systems, the FFS approach is vulnerable to losing its defining characteristics and consequently the quality of its implementation (van den Berg *et al.*, 2021). During interviews it became clear that forestry-related FFS also were vulnerable to similar risks.

Relevant published articles and available material show that the above concerns need to be accounted for. For example, in Figure 3, the public agencies responsible for the FFS on agro-ecology explicitly summarize their expert-led design (Martini *et al.*, 2016). The programme leaders set up a technical committee made up of forestry specialists responsible for defining the learning curricula and coordinating activities, as well as extension agents and communications staff responsible for imparting information and its dissemination.

In Ecuador, programmes experienced a similar, third-party-led transformation of FFS, where the FFS goal became the transmission of a predetermined, specific technical protocol, for example, on the best cover crops and soil management practices for the community (Sherwood *et al*., 2012). Instead of encouraging open inquiry and experimentation, facilitators tended to guide the participants to certain pre-determined agronomic conclusions. As explained by FAO (2002), in the absence of an open-ended, independent and self-directed learning process, such an experience is unlikely to produce the same degree of self-confidence, curiosity and leadership as that generally engendered through a more user-centred FFS experience.

Figure 3. The approach of the AgFOR project's farmer field schools applied to agroforestry in Indonesia


Government extension
Government extension
Experts who have strong knowledge and research capacity in commodities and other topics and who understand variations in the field
ToT
Sharing knowledge
Farmers and farmer groups in villages who have long experience with the commodity*
FtF
Sharing knowledge
Farmers and farmer groups in villages who have recently planted the commodity
OUTPUT
Expert farmers who have potential to be extension agents
OUTPUT
Information networks developed from farmer-to-farmer knowledge transfer

***Source**:* Martini, E., Saad, U., Angreiny, Y., Roshetko, J.M., Gunawan, H., Maulana, H.T., Suganda, G. *et al.* 2016. *Evaluation of the Agroforestry Farmer Field Schools on Agroforestry Management in South and Southeast Sulawesi, Indonesia*. Agroforestry and Forestry in Sulawesi Series Working Paper. Bogor, Indonesia, World Agroforestry Centre (ICRAF) Southeast Asia Regional Program. 16 pp. http://apps.worldagroforestry.org/downloads/Publications/PDFS/WP16002.pdf

Notes: AgFoR = Agroforestry and forestry: linking knowledge to action; ToT = training of trainers; FtF=farmer-to-farmer.

* The commodities are clove, cacao, coffee, maize, nutmeg, durian, rubber, vegetables, timber and agarwood.

4.3 Unique challenges in working with forest dwellers

During the stocktaking, a leader of a small Amazonian tribe that lived on around 385 000 ha in Ecuador approached the author about setting up FFS on agroforestry. After a lengthy conversation, the leader concluded that such an experience with a remote, nomadic Amazonian people may do more harm than good. He explained that his people were hunter-gatherers, and their lifestyles and knowledge systems were fundamentally in conflict with the westernized, scientific worldview and sedentary production systems that undergirded the FFS. Similarly, a respondent who worked with displaced people in Mozambique and who had ample knowledge of FFS and similar people-centred approaches explained that, as per her particular case of migratory peoples, FFS did not fit well with the living dynamics of forest dwellers and nomadic communities who, in this example, moved around out of need as well as culture. She thought that it was neither possible nor desirable for them to attend biweekly meetings nor to manage a situated plot.

During the interviews, a forester from northern Europe explained that, as practised in Europe over centuries, community forestry can involve administrative, legal, economic, scientific and social aspects that favour conservation, utilization, or commonly, a combination of each. Forest management can produce income from firewood and timber, wildlife, and tourism and recreational activities, such as birding, different forms of tracking and hunting, rafting, skiing and other sports. Whereas most forests have formal management plans in Europe, such explicit plans can be rare in the Global South, where privatization of natural areas and land tenure is sometimes less common (FAO, 2020).

The FFS principle has rarely been applied to either the sustainable, productive management of natural forests, or the empowerment of forest dwellers in South Asia. Encouraged by foreign donor agencies, in the 1980s, the Nepalese Government initiated a national community forestry programme, involving a shift of formal forestry management to communities and leading to the creation of FUGs. As part of initiatives to strengthen grassroots democracy in the 1990s, state policy provided provisions for FUGs to have legal status, own land and manage funds. By the turn of the century, there were well over 14 000 FUGs nationwide. The main purpose of these groups was forest conservation and not the productive or economic use of timber and non-timber products for local development (Yadav *et al.*, 2003).

From 2001 to 2002, the Regional Community Forestry Training Center for Asia and the Pacific (RECOFTC) developed and tested Farmers' Forest Management Schools to strengthen forest management skills and empower five FUGs in Nepal. Although Singh (2003) described this initial application as partly a failure, these experiences can be the most honest and instructive. The initial trials faced common problems with quality (facilitation, organizational support, unproven curricula); however, the work of one of the FUGs demonstrated the potential of FFS on community forestry. During a series of workshops in Thailand, Singh provided a detailed assessment of the practice of FFS on community forestry and its opportunities for strengthening national forestry programmes, in line with government efforts to hand over the use and management of forests to communities.

Drawing on the work of Gilmour and Fisher (1991), Singh (2003) clarifies the meaning of community in the context of CBF management. Forest management uniquely emphasizes public rights and access to, and management responsibilities over, a common-pool resource. A community is constituted by groups who organize around a heterogeneous collection of interests, which may include friendship, kinship, religion, profession, social class or merely contingency. In a place like Nepal, caste and ethnic groupings may be factors of differentiation.

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5. INSTRUCTIVE EXPERIENCES RELATED TO THE FFS APPROACH

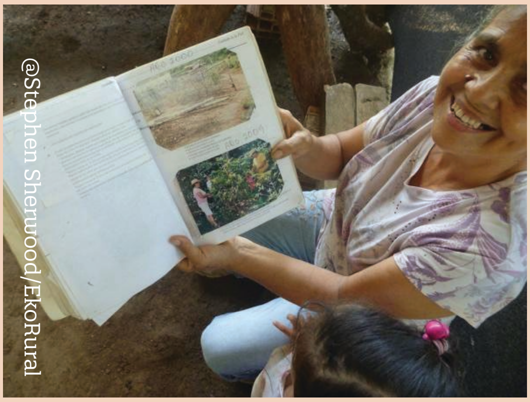
Throughout the stocktaking process, a number of respondents highlighted opportunities with regard to the applications of FFS on ecosystem restoration that merited further attention: natural regeneration, agroforestry, permaculture and analogue forestry. Discussions on the opportunities at hand will draw on the rich experiences of farmer-managed natural regeneration (FMNR) in West Africa and agroforestry in Colombia (Rodriguez, 2007; Hesse, 2013).

During interviews and a December 2020 consultation meeting with farmer trainers and forestry experts, colleagues in West Africa highlighted the experience of farmer-managed natural regeneration (FMNR), which has been a source of inspiration. Developed in Niger in the early 1980s, FMNR involves the large-scale regeneration and management of trees and shrubs from volunteer tree stumps, roots and seeds (Reij and Winterbottom, 2015). Today, FMNR has led to the growth of over 200 million trees covering 5 million ha, and is described as having made one of the most positive environmental contributions in the Sahel and perhaps in all of Africa (Reij and Garrity, 2016). Those working with FMNR debated whether FFS would contribute to the FMNR movement or weaken it. One participant suggested that certain aspects of FFS, in particular its intensive learning approach and social organization around participatory technology development, could help farmers and researchers to document and better understand FMNR. Another feared that FFS would divide communities and limit rural development resources.

Although La Cosmopolitana, an agroecological farm and training centre in Restrepo, Colombia, has not applied FFS, it is a pioneer in similar farmer-centred learning and farmer-to-farmer innovation to enable ecosystem regeneration. Similar to the FFS, La Cosmopolitana emphasizes basic biological principles, farmer-to-farmer extension and continual experimentation, as well as opportunities for people to develop their self-esteem, leadership skills and social organization. According to the experience of a farmer leader, Rubiela Góngora (Box 12), the approach has enabled them, as families displaced by the three decades of civil war, to convert a desert into an oasis. From a technical forestry perspective, they achieved this by incorporating insights on forest ecosystems to transform the landscape, in particular by asking a series of questions rarely found in an FFS:

- How is a forest ecosystem organized?
- What are pioneer, secondary and primary species? What do they have in common? How do they differ?
- What are the advantages of a layered polyculture?
- What is ecological succession?
- How to design a successional polyculture system?
- How to establish a successional polyculture plot?
- How to manage a successional agroforestry plot?

Box 12. Helping resettled families transform their lives and ecosystems through agroforestry: the story of Rubiela Góngora in the arid plains of Orinoco, Colombia


@Stephen Sherwood/EkoRural

Between 2000 and 2010, the inhospitable flatlands of the Orinoco plains were the relocation site of tens of thousands of families displaced by Colombia’s 35-year civil war, who were forced to leave the lush inland mountains regions of the country.

In the late 1990s, the national government forced entire villages to leave so that it could confront informal military forces that had occupied the surrounding mountainsides. Rubiela Góngora, a community forestry leader, explained that her community was forced to be driven by cattle truck for several days from the lush mountainsides of Manisalves to reach the highly degraded, dusty Orinoco lowlands, where each family was given 50 ha of dry, hard-packed clay and rock. She said that, upon arrival, they were all shocked by the ‘lunar’ landscape and extreme temperatures. They had no idea how they would survive.

Just 15 years later, the landscape surrounding Rubiela’s community was lush and green. She explained that shortly after arriving, a farmer organizer arrived one morning to invite a small group to La Cosmopolitana, located just a few hours across the plans in Restrepo. Founded by Roberto Rodriguez and Monika Hesse in the 1980s, La Cosmopolitana Agroecological Farm began as a degraded, 40-ha pasture that over time was converted to a lush nature reserve and learning centre. “That is where I began to feel that I had a right to dream,” she explained. There they studied the forest and learned about how to produce soil and design an agroforestry system. “The trees are just a means,” she added. The goal was to build a forest like where she had grown up, which would attract birds and animals. Pointing to the hundreds of trees that she had planted, she explained:

> *Here, we created our own ecosystem. Before when we planted, the insects would eat everything we placed in the ground. Now the birds are our allies. One arrives with her traditions, but you have to grow into new knowledge that responds to the land that you are given, and the life that you desire […]. Today, 15 years after having arrived and 10 years with La Cosmopolitana, we are* nearly *independent. We just need to overcome the theme of electricity, which has us dependent and that is always increasing its prices.*

Rubiela then took me out back to show me a new pig pen and biogas chamber. She continued, “Come back in three months, and I’ll make you dinner with our own fuel, and I’ll read you a book with our own light.”

Similar to some of the PPPs in Brazil, Kenya and West Africa, the NGO Los Aliados has been employing a hybrid FFS approach to help Amazonian forest people navigate market integration (Box 13). This has involved a strategic partnership with Terrafertil, an Ecuadorian natural foods company that manages product development and marketing. The FFS approach has been used to help rural families mobilize their knowledge of the Amazonian *chakra* as a means of generating income without undermining biodiversity. In particular, they

Box 13. Los Aliados: strengthening the traditional Amazonian *chakra* through micro-enterprise development

Faced with the arrival of outside influences in the northern Amazon, Los Aliados and a group of Amazonian Kichwa farmers joined forces to establish a business venture with Terrafertil, a company dedicated to healthy food products with a proven commitment to working with smallholder producers. Through an adapted Farmer Field School (FFS) action-learning approach, the partners re-introduced *muru inchi*, a high-protein, high-fat, aflatoxin-free, wild jungle peanut, in the traditional *chakra* agroforestry systems. In the process, participating families earned new income from limited sales and gained new appreciation for the forest. The participants are beginning to develop the capability to represent and defend their collective interests autonomously.

Community representatives expressed a desire to return to social cohesion, a peaceful lifestyle and intact natural surroundings, yet they were also interested in gaining access to markets, the services and material benefits of modern society. Navigating this change has been difficult since rural Amazonian families have limited experience managing currency and producing sales. This activity may bring opportunity, but it also introduces a threat to their way of life. In light of this situation, Los Aliados helps families and communities enter the future on their terms.

After years of successful market ventures with smallholder farmers in the Ecuadorian and Colombian Andes, Terrafertil is now interested in bringing this experience to the Amazonian people. Nevertheless, it does not have easy access to these remote communities to establish sourcing systems within traditional Amazonian territories.

Los Aliados adapted the FFS learning approach to help Terrafertil begin sourcing *muru inchi* from farmers in three Amazonian provinces. In 2018, it brought together 33 farmers to fill knowledge gaps through discovery learning with *muru inchi* and small-scale experimentation to develop best practices. At the organizational level, the group has been experimenting with appropriate community enterprise structures that can support more efficient value chain production and that are accountable to, but ultimately separate from, traditional governance structures. Los Aliados is working closely with the community's corporate partners to develop new products, negotiate prices and terms of trade, and provide hands-on support to set up wholesale distribution systems. In 2020, on the back of an imperfect but successful first sale, the company purchased USD 3 722 of *muru inchi* from Amazonian farmers, and has committed to buying significantly more if farmers can increase volumes sustainably. Most importantly, the initial success with *muru inchi* has opened the door for opportunities with a variety of other attractive Amazonian products, including lemongrass, hibiscus, black pepper, ginger and turmeric.

Successes to date:

- initial sales of USD 3 722 of *muru inchi* in 2020 and the resulting commitment by Terrafertil to buy significantly more (all smallholders' production) at a fixed price;
- commitment from the company to actively support this new value chain by hiring staff and providing training to farmers in Orellana, Napo and Morona Santiago;
- commitment from the business partner to replicate this experience with other products, including lemongrass, hibiscus, ginger and turmeric. The community partners will first need to demonstrate an ability to provide a stable production of high-quality products.

Lessons learned:

- Small-scale piloting can improve understanding of issues that can reduce the risk for companies and community partners entering into a new venture.
- Knowledge-based support to a network of highly innovative farmers holds great promise for technology development that can enable sustainable, viable economic ventures.
- Participants are increasingly optimistic that Amazonian people can convert the *chakra* system into a resilient livelihood strategy and an alternative to forest degradation.
- The start-up phase is uncertain and can be stressful – for farmers, who must invest time and energy in something new (and who have been disappointed many times before) and/or business partners, who demand certainty in volumes and quality; and for Los Aliados, who are charged with managing sometimes conflicting interests. By prioritizing a learning-in-process approach, partners can be better prepared, and uncertainty and differences can be better managed.

have sought to fill knowledge gaps in the production of traditional, high-value foods while conducting experiments to test and develop best practices in achieving quality standards and production volumes.

Moreover, the work of the *Aula Viva* involves a growing number of people who have experienced the armed conflict in Colombia and wish to save the Amazon as they save themselves (Box 14). FFS shows that people's science and social organization need to be accounted for when aiming at building ecological literacy.

The work presented here merely scratches the surface of similar initiatives that could enrich FFS on forestry and be supported through collaboration. These are just a few of the examples that respondents highlighted as similar, instructive experiences of FFS. Clearly, there is substantially more work on which to draw for inspiration and collective leveraging. FFS programmes seeking to integrate agroforestry should draw on these experiences and find ways to join forces, in particular, to enable a localized institutional transition towards more regenerative agriculture, agroforestry and natural resource management.

Box 14. Saving the Amazon one *chakra* at a time

@Stephen Sherwood/EkoRural

Sandra, a community organizer from the Catholic Church's pastoral social work initiatives, arrived in the Ecuadorian oil town of Lago Agrio. Sandra and other visitors came to learn about the *Aula Viva* (the living classroom). Sandra explained that they would be meeting up with a group of displaced people from different parts of the Amazon. Many had been kidnapped from their family and forced to join one of the armed groups, the guerrillas or drug lords. As part of the ongoing peace process, the Colombian Government relocated them in the Amazon, although often a long way from home. They were part of a group of farmers seeking to rescue the traditional Amazonian *chakra* – a traditional agroforestry practice that was threatened by colonists who had arrived to clear-cut the jungle and plant grass for cattle.

The traditional Amazonian *chakra* involves cultivating multipurpose crops and trees, and even raising animals, including wild species, as well as managing multi-storey shade trees. "The *chakra* basically resembles a jungle," she explained as she pointed to a seemingly abandoned, densely populated and diverse plot of trees and bushes alongside the roadway. She added, "We think of this agroforestry system as an edible forest."

The group of displaced people consisted of about 20 Amazonians at the homestead of a Colombian-born couple who had recently escaped across the San Miguel River to the relative safety of Ecuador. The visitors were introduced to the husband, who explained that after one particularly violent attack in their village by one of the armed groups, they had decided that it was time to abandon their home.

The visitors joined the couple for a walk about the farm – around 12 ha of largely barren, degraded pasture. Along the way, people asked questions about why the couple had left the abundant jungle for this wasteland. In crossing over the border to Ecuador, the husband explained, "We came in search of peace and the opportunity to work the land with dignity." As illegal aliens, the couple has recently sought help from the local church to obtain a land title and to 'technofix' their farm.

Upon arriving back at the house, Martha, a facilitator from *Fundación Caminos de Identidad* (FUCAI), a non-governmental organization (NGO) that worked that worked with the Sikuani people of the Orinoco, asked them to come together in the patio. She explained to the couple that each of the farmers had brought along a favourite Amazonian plant, and that the group wanted to make a collective offering. The participants formed a circle around the large collection of seeds and plants of different colours, shapes and sizes. There were different types of palm, mahogany, citrus, cacao and a number of exotic fruit and nut trees that only a local would recognize. Cupping hands and bowing our heads, Martha conducted an impromptu ceremony, pausing regularly for them to say in unison:

> *I have arrived with a seed from the hearth of my home to honour you for receiving me today. This seed comes from a plant that my family and I nurture as a vital part of our* chakra*. In return, each plant harvests the sunlight and provides my family energy in the form of the wood that cooks our food and heats our home. This plant provides shade, fresh*

> *air and fruit. As this seed comes from a plant that provides nourishment for my family, I too bring nourishment to your chakra. This is my gift, our gift, of sustenance and life for you and your family*.

When asked where best to plant the trees, Martha responded that there was no one 'right way' to plant a *chakra*, before adding, "It's about connection and feel." A young boy added, "A *chakra* is a living organism through which we simply flow." With that preamble, he used a stick to draw in the dirt a picture of the layout of the land. Martha explained to the owners, "As payment for our visit, each of us has brought along a favourite tree – something special from their *chakra*…." The boy interrupted, "We want to give a 'new look' to this farm."

After considerable debate, it was clear where each tree should go. The group spread out to plant each tree in the ground. Upon departure, Martha invited the couple to join the group for a visit to a new family in two weeks. "Just be sure to bring along a favourite tree… We are here to save the Amazon and to save ourselves, one chakra at a time."

@FAO/Max Ochoa

6. ENABLING INSTITUTIONAL CHANGE

6.1 Farmer field schools as a means of socio-technical change

Over the last 150 years, humans have become a major force of nature, capable of disrupting fundamental biological processes at the planetary level (e.g. Röling, 2000b). People now need to learn to live and prosper within the planet's ecological boundaries; the operative question is, how?

Institutions are collective sets of formal and informal rules in the form of routines, protocols, norms, values, interpretative schemes, incentive structures and regulations that ultimately shape problem definitions, inform perspectives, engineer practices, and exploit niches of development opportunity. Institutionalization involves a fundamental change in worldview, values, dreams and aspirations. Under continuous processes of formation and re-formation, socio-technical networks spontaneously rise, fall and re-organize around symbols and bodies of knowledge. The aim is to challenge existing norms, creating rules and implementing regulatory frameworks that affirm certain ideals, such as best practices, while marginalizing others (Rip and Kemp, 1998). Institutions can vary significantly depending on whether they are public, private or indigenous, such as in their objectives and challenges, and the extent to which they are reliant on external forces (markets, technology, etc.). For example, forest smallholders and local communities may set rules, establish practices and organize themselves to access land tenue and ownership on forests, technology and productive resources.

For FFS to remain close to the principles of the concept, organizations and actors involved need to follow the key elements of FFS mentioned in Box 10. However, some implementing actors may not be completely at ease with implementing certain elements, leading to a process of negotiation and integration between the elements that characterize the FFS approach and those that characterize the standard approach used by implementing organizations. For instance, one of the key principles underlying FFS is considering farmers as experts in their own fields. Farmers hold a great deal of agricultural knowledge and constantly adapt and innovate their practices to fit the challenges by sharing ideas based on their experiences. The FFS space aims to facilitate this process of innovation and knowledge building. However, this acknowledgement of farmers' knowledge may not fit the linear mode of technology transfer, which often characterizes the way research and extension organizations work, i.e. knowledge derives from research to be transmitted from researcher to extension worker to recipient farmer. And yet, research is essential to address new elements beyond the lay knowledge of local farmers and communities in forestry and agriculture, such as carbon sequestration, soil microbiology and the control of new pests/diseases due to climate change. This prompts two questions: how development partners, facilitators and research organizations can carefully introduce new techniques and knowledge needed by the farmers to face emerging global challenges while respecting and integrating local institutions and traditional knowledge; and how FFS can become an instrument of dialogue between researchers, extension agents and farmers in the search for joint solutions to key challenges to food system sustainability.

From an institutional perspective, the establishment of a people-centred design and the opening up of pathways to its growth in prestige and influence may be the main purpose of CBF and FFS. Numerous studies demonstrate how FFS can provide a strategic break with conventional agriculture and standard extension approaches, primarily through adherence to its people-centred educational designs and emphasis on farmer-led knowledge and technology development, and social organization (for a summary, see FAO, 2002). In these cases, FFS may offer an opportunity for participants to test farmers' and researchers' solutions to find the ones best adapted to their needs in their own fields. Other studies show how some institutional actors have often reformulated FFS, effectively going from a farmer-led, people-centred approach to an externally led, technology-centred one (Sherwood, Schut and Leeuwis, 2012). How FFS is used is used by a development practitioner can ultimately shape its contributions to social change or continuity.

FAO (2002) introduced "community IPM" as a metaphor of the collective embrace of nature-based, more holistic IPM as well as the associated social organization involved in conducting field schools, farmer-led experimentation, and the emergence of leadership. Drawing on the sustainable livelihoods framework, the authors describe this as a matter of advancing a series of capitals: social, human, natural and financial/physical.

Accordingly, in order to institutionalize the FFS approach, partners in development practice must enter into agreements on forms of collaboration, on the set-up structures and on financial, technical, capacity building, organizational and other support arrangements. In the context of FFS, the challenge is summarized as one of facilitating widespread integration of people-centring and experiential learning processes within the methodologies and interventions of key stakeholders, including public, private and community agencies. While several international organizations have integrated FFS as one of the key methodologies in their practice,[8] the longer-term institutionalization of FFS, especially in national technical ministries, has proven to more complex.

Given growing public awareness of the shortcomings of conventional agriculture, a commitment to the purposes of FFS does not merely involve learning to work within existing institutional frameworks and organizations. As explained in FAO (2002), the aim of FFS is to transform these systems, in particular with regard to issues of promoting localized "response-ability" and autonomy, for example, from externally based inputs such as excessive use of agrochemicals. Nevertheless, FFS do not operate in a social vacuum. Studies find that the central features of FFS – user-defined curriculum, open-ended learning, analysis of the agroecosystem and farmer-led experimentation – are commonly translated into more convenient pedagogy (Sherwood, Schut and Leeuwis, 2012). In the process, FFS can become similar to more conventional, technology-centred approaches.

To what extent are FFS on forestry and agroforestry enabling participants to experience and create new models of agriculture at different scales?

6.2 The state of farmer field school practice

Two recent FAO studies of the institutionalization of FFS describe facilitators and participants involved as leaders and FFS practitioners belonging to a geographically organized and distributed group, such as a community, national-level body, public institution, civil society organization, private service provider, international organization, or network operating at different levels (Chuluunbaatar and Cofii, 2017; FAO, 2018). Drawing on data from the previously mentioned 2020 stakeholder consultation, a strengths, weaknesses, opportunities and threats (SWOT) analysis of FFS on forestry and agroforestry (Table 4) was conducted. The SWOT analysis assesses factors that are internal and external to a particular actor network, as well as current and future resources and potential. The analysis was used to address questions on how well FFS is working, what can be reasonably improved, and which nearby resources and possibilities could be exploited. It also draws attention to competing interests and threats to the FFS and its proposals. Based on the outcomes, participants prioritized four readily available and sure-to-succeed, “in-pocket” opportunities for advancing the institutional change needed so that FFS on forestry/agroforestry can reach their full potential: (i) ensuring gender and social inclusion; (ii) shifting from a perspective of scarcity of resources to one of abundance; (iii) forging new alliances and transforming agencies from within; and (iv) bridging the distance between actors with digital technology, which are described in the subsections below.

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[8] See, for instance, the partners' organization listed as part of FAO's FFS partners' network listed here: www.fao.org/farmer-field-schools/partners/en

Table 4. Core strengths, weaknesses, opportunities and threats (SWOT) of farmer field schools on forestry and agroforestry

Strengths

- Three decades of success of farmer field schools (FFS) and community-based forestry (CBF) (global)
- The short-term production focus, which can help compensate for the inherent time delay of tree-based integrated production
- Extensive and diverse experience of CBF and FFS, including in areas of agroforestry (global)
- Growing relevance of trees in an era of rising climate variability (Africa and Central America)
- New appreciation for the importance of perennial agriculture: stabilizes soil, prevents erosion, enhances the land’s capacity to store water, moderates air and soil temperatures, and provides stable food production
- FFS uptake within local organizations, non-governmental organizations (NGOs) and government
- Combining agriculture, integrated production, and landscapes (Southeast Asia).

Weaknesses

- Slow timeline of trees for food production and slow economic returns (global)
- Dependence on externally based knowledge and technology (global)
- Frustration with the slowness and unpredictability of “participatory approaches” (global)
- Conflict between trees and mechanized agriculture (global)
- Silo-thinking, narrow themes, short timelines of donors, and project-oriented development (global)
- Focused on annual food crops and not perennials
- Relatively little understanding of trees and forestry by FFS master trainers and facilitators
- FFS emerging out of a tradition of food production and not environmental conservation and stewardship
- Consumer refusal to pay for environmental services.

Opportunities

- Long-standing experience of Indigenous Peoples and forest dwellers in home gardens/*chakras*
- FFS can help to address the lack of stable, state-based extension/rural development programmes in various countries (Latin America and elsewhere)
- Growing appreciation and influence of family farming and agroecology, and the need to strengthen it through perennials and forestry
- Potential income-generating opportunities from agroforestry and permaculture systems. The increasing cost of chemical fertilizers opens the door to the usage of organic fertilizers and composting (global)
- New awareness for fresh foods and local markets as a result of COVID-19 (global)
- Inherent advantage of perennials and trees with respect to the growing weather fluctuations associated with climate change (global)
- Need to increase the profile of trees in family farms for climate change mitigation.

Threats

- Current shape of global agri-food system, which undermines family farming, agroecology and agroforestry
- Rural culture that views trees (in particular, non-fruit bearing species) as antagonistic to production
- Continued conventional agricultural in farming and food – and lack of tenure security
- Ongoing expert co-option of FFS (global)
- Existing industry around patentable technology (global)
- Degrading environment: genetic resources, water, soils, pests, climate change (global)
- Social crisis: emigration, the ageing population in rural areas (global)
- Power disparity between rural people and private business interests (global).

a. Gender and social inclusion

As in other aspects of rural life, girls and women continue to be systematically excluded from the benefits of forestry production. Giri (2009) showed how even during the outmigration of males, women and girls faced substantial difficulty in influencing community forestry and gaining access to the factors that govern forest products. This experience sheds light on the substantial structural matters that perpetuate the marginalization of girls and women in rural villages throughout the Global South.

Throughout the globe, most youth are moving away from rural farms to urban centres, and there is a growing lack of interest in working in agriculture (Gartaula, 2010). The men and women who do stay in agriculture do not necessarily do so by choice, and they do not seek longer-term sustainable or regenerative agroforestry, but rather short-term financial gains through cash cropping. Wealthier families, in particular higher caste men, seek scholarships and other opportunities to go abroad, often achieved by drawing on their family's social capital. Young women want to study and work in the NGO sector or in hospitals, or teach at primary schools.

FFS have a long history of addressing gender and social inclusion with rural families and communities. For example, FFS on IPM in Southeast Asia helped participants reduce pesticide exposure while addressing concerns over family violence. FFS in Uganda have sought equal participation of women and men in decision-making, rights, control of family assets and benefits of development initiatives and employment opportunities. While centred on youth interests and life-planning skills, this work also helps rural families address gender-based violence and HIV/AIDS prevention. In Niger and Senegal, FFS on climate change adaptation have teamed up with Dimitra clubs that promote women's empowerment. Operating in rural areas of sub-Saharan Africa, Dimitra clubs are groups of women, men and young volunteers – mixed or not – who seek to solve problems and bring about changes in their communities through the creative use of local resources. While focused on climate change, these FFS-Dimitra groups make space for participants to address women's priorities, such as domestic violence and sexual and reproductive health.

During interviews, no examples were found of FFS on forestry and agroforestry that strategically addressed gender and social inclusion to the same degree as the above-described work from Uganda, Niger and Senegal. Nevertheless, in addition to concerns over the multiple forms of violence against women and girls, interviewees working in the Americas, Africa and Asia pointed to another concern. Throughout the Global South, an entire generation was not interested in working in a rural village or living in remote areas without the benefits of modern society. Young women wanted to study and get jobs in education, hospitals or the service industry in the city. In addition to its focus on fruit tree and forest production and conservation, FFS on agroforestry should aim to create new opportunities for social inclusion, with particular attention to cross-generation relations and youth retention.

Experience implementing FFS to date suggests that it is essential to observe and understand village inter-personal histories as well as social processes and dynamics in order to gain a nuanced understanding of how they can be affected by and affect the outcomes of FFS programmes. Ultimately, programmes need to bring to light patterns of discrimination while creating space that uniquely enables women's active participation in problem assessment, priority setting and intervention design and implementation so that those patterns can evolve positively. With dedicated attention, FFS on forestry has much to offer in strengthening the position of women and girls in forestry access and resource utilization for both conservation and economic development. FAO has developed resources that may be useful for beginning such work (e.g. Deotti and Estruch, 2016).

b. From scarcity to abundance: applying insights of the forest-to-farm system design and management

For FFS that assist participants in transforming their agriculture from an annual to a polyculture systems that includes perennials and trees, change requires to shift away from the idea of "scarcity" that characterizes conventional agriculture, to a discovery of the endless potential of "abundance" in biology and ecology (Box 16). Promoting greater soil and plant life in farming lies at the heart of FFS on agroforestry, which explains why collaboration between like-minded production and conservation groups is so relevant.

c. Transforming agencies from within and new alliances

Despite the frequent focus on technology adoption of national ministries of agriculture and forestry, international research centres, development partners and other stakeholders, during interviews, respondents listed a number of promising movements in the international community of development agencies. Box 17 provides a sample of large regional development partners, research institutes and NGOs that have been involved in using FFS as a vehicle for enabling change, with varying degrees of commitment, success and contribution. All agreed that there is need to expand this network, for example, by forming strategic alliances with the agencies concerned about environmental and conservation issues associated with areas such as biodiversity decline and climate change. These institutions, given their number, represent

Box 15. From scarcity to abundance: applying insights of the forest to unleash the biological potential of soils in Honduras

@Stephen Sherwood/EkoRural

Through ecological literacy and continual experimentation, farmer field schools (FFS) seek to unleash human creativity and the abundance found in biological and ecological systems (i.e. life resources) to solve practical problems on the farm, in the forest, and in the community. For example, deep knowledge of forest biology can help farmers shift their thinking of soil from being a finite body of nutrients to being a living organism capable of continuously mediating essential life processes between the planet, the atmosphere and sunlight.

In Honduras, FFS facilitators have taken farmers into the forest to discover how soils work in nature. Farmers conduct comparative studies between degraded agricultural soils and those of a nearby forest. Participants study the surface and dig holes to look at animal populations, moisture and root growth. They perform macro-arthropod counts as a proxy indicator that is useful for measuring the abundance and diversity of soil life between the forest and farm, tied to human interventions. The facilitator then asks the participants, "What can the forest teach you about how to improve the soil management in your agriculture?"

Responses to the above question have led to further studies and experiments, for example, to mimic ground cover, increase soil organic matter, and feed beneficial microbes (single-celled organisms) and animals (multi-celled organisms). Insights on the importance of soil structure for long-term soil health have led farmers in the agroecology movement to question the long-standing emphasis on managing plant nutrients, primarily through highly soluble fertilizers, such as fresh animal manures that can weaken a plants' rhizosphere and undermine the activity of white fungi, which are involved in building soil aggregates.

One FFS graduate explained, "Everything important occurs in a soil's spaces: the movement of water and worms, air and root growth…." She summarized, "Good farming is not about filling a soil with manure; it's about conserving a soil's spaces for the worms, the water, the roots."

For decades, farmers have been taught that their compost piles needed to be based on a recipe of 30 parts nitrogen to one part carbon. Due to the insights gained through FFS studies of forest soils, the farmers, scientists, technicians, cooks and other actors in Ecuador's *Colectivo Agroecológico* have embarked on applied action-research on how to promote the proliferation of white fungi. This is essential for conserving and building soil aggregates and spaces, and for expanding the effective reach of a plant's roots, according to some scientists, by over 600 times. Farmers are now building bioreactors with a carbon to nitrogen ratio of 60:1 or more in order to favour the emergence of a fungi-dominant compost (see image below). Instead of incorporating the compost into their soil, as they've done for decades, they now mimic the forest by placing this stable, woody compost on the surface, which promotes moisture, protects micro-pores, and enables a crop to find its own nutrients.

@Stephen Sherwood/EkoRural

Box 16. International partners that support farmer field schools in forestry-related themes

Over the last 35 years, a diversity of international agencies, including research institutes and donor agencies and non-governmental organizations (NGOs), have invested in farmer field school (FFS) projects as a vehicle to build self-esteem, strengthen local capacity, and promote social organization. The FFS activities were sometimes limited to purely technical contributions, for example, in the production of export crops. Other times, FFS have been described as a vehicle to build empowerment, emancipation and social change. The different orientations offer unique opportunities and challenges for working with FFS. Often, large organizations such as FAO are made up of competing communities and face internal struggles. While it would not be possible to include an exhaustive list, during interviews, respondents highlighted forestry-related work of the following agencies:

- Asian Development Bank (ADB): Beginning in the 1990s, ADB made large investments in FFS for integrated pest management (IPM) in export-oriented estate crops with smallholder farmers in Indonesia.
- Catholic Relief Services (CRS): CRS has applied FFS for many years. Presently, it is using the approach to help farmers in Central and South America, as well as in East Africa and Southeast Asia to improve the management of cash crops such as coffee, cinnamon, vanilla, as well as of fruits and endemic trees, in addition to addressing climate change adaptation.
- CGIAR: While many CGIAR research centres have applied the FFS approach, the Center for International Forestry Research (CIFOR), the International Institute of Tropical Agriculture (IITA) and the International Livestock Research Institute (ILRI) have specifically applied it to farmer-led management of trees and forests for diverse development interests, including food security, sustainable livelihoods, soil and nature conservation, and climate change adaptation.
- The Global Environment Facility (GEF): From 2009 to 2014, the GEF financed the Transboundary Agro-Ecosystem Management Project for the Kagera River Basin (Kagera-TAMP) in Burundi, Rwanda, United Republic of Tanzania and Uganda, which conducted FFS on agroforestry, silvo-pastoral systems, woodlot production and income generation. Environmental themes included trees for soil conservation and watershed protection, biodiversity, and climate change adaptation and mitigation.
- Green Climate Fund: Responding to growing public concern over climate change, environmental agencies such as Green Climate Fund have invested in forms of regenerative agriculture for climate change adaptation and mitigation; their interests are primarily nature conservation.
- Groundswell International: Groundswell's partner organizations have applied FFS to forestry-related concerns in Guatemala, Honduras, southern Mexico and Ecuador. In addition, its members in West Africa have applied similar, farmer-centred approaches to study and strengthen farmer-managed natural regeneration.
- Japanese International Cooperation Agency (JICA): Since the turn of the century, JICA has been a major supporter of FFS on social forestry and extension, especially in East Africa. Themes have included export-oriented production and natural resource management in Kenya, and agroforestry, pastoralism and charcoal in Ethiopia.
- International Fund for Agriculture Development (IFAD): IFAD has supported projects that apply FFS to strengthen family farmers and producer organizations, especially in Africa, focusing on agroecology and nutrition for vulnerable populations. In addition, since 2008, the Cordillera Highland Agricultural Resource Management Project (CHARMP) in the Philippines has addressed crop diversification, fruit tree production and forest fire prevention.
- MISEREOR: This German Catholic Church organization has long been committed to people-centred development, especially in Latin America. In Honduras, this has included providing support to investments in FFS for strengthening work with voluntary promoters.

- Swisscontact: This independent non-profit agency supports FFS on forestry in Aceh, Indonesia and Piura, Peru focusing on cacao, coffee and other fruit tree production for income generation. The focus has been on a series of business-oriented modules on good practices in finance, productivity, environmental management, social organization and family nutrition.
- United States Agency for International Development (USAID): Beginning in the early 1990s, USAID has supported FFS on fruit tree production and other aspects of agroforestry as part of a regional development and environmental protection programme in Southeast Asia. This work has extended to other regions, including Central and South America. Typically, the focus is on cacao, coffee and other commodity crops.

an opportunity to advance forestry and agroforestry through the FFS activities and projects they implement, contributing to achieving global targets such as SDGs, sustainable production, climate change adaptation and mitigation and restoring ecosystems.

d. Bridging the distance with digital technology

Recent innovations in communication technology are a highly promising area where users are actively narrowing the distance between one another and different sectors of food production and consumption. Over the last 25 years, FAO has been promoting the use of cellular and digital access to information in and throughout the Global South. The FFS production team and its partners have been making further use of electronic media for information exchange and educational purposes, including the development of specialized resources for farmers and courses for programme staff.

In the United States of America, the United Kingdom, Europe and Australia, farmers and their organizations have been making greater use of information and communication technologies, and broader digital media to share experiences and promote debates. In recent years, a growing number of podcasts, YouTube channels, Facebook pages, WhatsApp lists, discussion groups and other means of electronic media have emerged where producers, technical support staff and enthusiasts continually share practical information and experiences. They enter into lively debates on critical issues in areas such as consumer-supported agriculture, organic farming, regenerative agriculture, urban agriculture and forestry and hydroponics. Initially, professionals from university and government-supported extension services established programmes, but with the advent of Podcast and YouTube, practitioner-led content is far more popular and seamlessly crosses borders.

As an example of the growing cosmopolitan nature of such practitioner-led, on-line media production from the field, a permaculturist from Puerto Rico conducting graduate studies at Wageningen University in the Netherlands pointed out the work of the "urban farmer".[9] Participation is voluntary and relies on social relationships and networks. In daily and weekly programmes, farmers, cooks and business people lead conversations on thematic areas such as: how to finance the purchase of land and initial equipment, farm set-ups and planting schemes; effective tools; zero tillage; soil health; seeds; direct marketing strategies and e-commerce. FFS broadcasters bring in thematic specialists to discuss, *inter alia*, the history of family farming, agroforestry and climate change. The online sites or radio stations where this information is broadcast are often managed by growers or highly experienced technical staff. Today, many of these programmes have attracted a large international following. For many, they have become the leading source for finding answers, exploring new possibilities, and staying inspired.

Based on conversations with a group of producers at *Minga por la Pachamama*, Public Radio in Ecuador and a regional radio programme, *Coordinadora de Medios Comunitarios Populares*

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[9] See The Urban Farmer, https://theurbanfarmer.co

y Educativos del Ecuador (CORAPE), the use of such media in South America is less developed; farmer interaction tends to be limited to discrete questions in WhatsApp or Facebook. Content is distributed through regular programmes, which are, however, usually less interactive and are limited to the sharing of recorded on-line voice interviews and video footage. Rural people may upload footage, but their contributions are not commonly structured into a regular programme. During the COVID-19 pandemic, focused webinars and video conferencing via Zoom, and other on-line software became very popular among urban-based enthusiasts as well as farmers. These were supported by actors working in social movements, often with financial support from an NGO, and included such themes as urban gardening, disease and IPM, e-commerce, and other forms of direct purchasing, family nutrition, cooking and fermentation. Farmers generally took part, but unlike their counterparts in the Global North, they did not usually organize and run programmes. The communication specialists felt that as rural people gain better access to the internet and communication technology, and learn about self-financing through on-line advertising in media such as YouTube, farmer-led content production will become a growth area in the future.

A master trainer working in an FFS on forestry in Mozambique mentioned that the challenge with digital media was “going deep”. He explained that digital encounters tended to be mostly informational and that it was difficult for participants to acquire the experiences needed to foster critical reflection and thinking necessary for higher learning in ecological literacy and farmer-led experimentation. It was even more difficult for participants to build the self-esteem, leadership and interpersonal dynamics needed for social learning and organization. While exploring ways of working with digital technology, it is necessary to involve local actors in continually innovating content, media and processes. The aim is to understand how far-reaching, relatively inexpensive digital platforms can better contribute to the creativity, critical thinking and social skills needed for local empowerment and development.

6.3 Do farmer field schools on forestry and agroforestry empower users and promote creative, sustainable problem-solving?

At a group or community level, as demonstrated in experiences across the Global South, it is clear that, when fully implemented, an FFS on forestry-related areas can have similar impacts on ecological literacy and unlocking creative capacity to FFS on IPM and other agronomic themes. FFS on forestry can improve the assimilation of insights from the forest and perennials in agriculture as well as the productivity of certain functional trees species, such as N-fixing shade and forage varieties, as well as fruit tree production for income generation. Just as with the first field schools focusing on IPM, the root problem is not one of knowledge or technology, but rather, it concerns the institutionalization of FFS and more broadly of critically informed, people-centred, user-led innovation in food, agriculture and natural resource management. As such, this challenge is largely normative and institutional.

Participants in the FFS led by *Asociación Nacional para el Fomento de la Agricultura Ecológica* (ANAFAE, National Association for the Promotion of Agroecology) in Honduras have many years’ experience in creative soil conservation, integrating green manures and minimum tillage into agroforestry systems. In Indonesia, the Environment Services Program’s creative partnerships with bottling companies and other private actors downstream the watershed supported their experimentation with biogas, cut-and-carry forage systems and coffee planting. In Ecuador, 15 years after graduation, leaders from MACRENA-led FFS on agroforestry have diversified projects and social organization. In these examples, innovation can be observed at all levels of activity – problem identification, curriculum design, facilitation, and testing of ideas at home and in school, as well as partnering and social organization.

Most technical professionals in NGOs, government agencies and research institutes focus their extension practice on promoting scientifically determined best practices. (See Box 18 for an example of a programme that began as a straight-forward FFS to cacao and coffee production to become more techno-centric approach to this production.) This evolution shows the role that traditionally trained agronomists and foresters can play as social networkers and power brokers.

Box 17. From the farmer field school to farmer coaching visits in Viet Nam

Farmer coaching visits (FCVs) are considered an improvement to the farmer field school (FFS). Concerned about the limitations of the impractical group meetings of FFS and the resulting low adoption rates, in 2015, Hanns R. Neumann Stiftung (HRNS) championed FCV as a means of improving the efficiency and retention rates of its extension work with coffee farmers in the Central Highlands of Viet Nam.

Similar to the training and visit system, FCVs involve direct visits of an expert to each individual farm, where both the farmer and the expert coach can assess the strengths and weaknesses of current and alternative agroforestry practices. Instructors are equipped with a set of posters and a toolkit to help explain agronomic concepts to farmers and to resolve their problems.

Whereas an FFS reaches 25 farmers in a 1 half-day session, a trainer applying FCV would need 3–4 days to reach the same number of farmers. According to the Regional Manager, what is lost in quantity is gained in quality. He explains that improvements, for example in pruning, are implemented immediately. In addition, during visits, the coach can address other questions that may arise.

In order to address the problem of scale and to reach a target of 180 000 farms in three years' time, HRNS seeks to intensify its Training of Trainers programmes and increase the pool of FCV trainers from 150 to 250. The Regional Manager argues that ultimately, FCV enables the foundation to simultaneously advance two objectives: to provide farmers with direct and high-quality support, and to document descriptive data and adoption rates on a daily basis and monitor progress.

Note: For further information on FCV, see www.hrnstiftung.org/augmenting-trainings-for-smallholders-from-field-schools-to-coaching-visits

A central goal of the FFS approach is to empower marginalized populations, in particular, the rural poor, and to restore a greater balance in development. In order to achieve greater people-centring in rural development, an FFS on agroforestry initiative will need to establish a set of agreed principles as well as the means of continual oversight and control over project assessment, design and implementation. Given the limitations of present-day best practices in extension, development and business, sustaining and advancing an FFS as a means of advancing people-centred development will continue to demand considerable foresight and creativity.

6.4 Upscaling people-centred, environmentally sound rural development

Drawing on the FFS and CBF as pathways to ecological literacy, sustainable natural resources management, economic development and social change, the successful institutionalization of environmentally informed and people-centred development in localities across the globe is as necessary and urgent as it is ambitious.[10] Advancing the transition towards agroecologically abundant systems of food, agriculture and natural resource management could be understood as an underlying, common purpose of the FFS' application in forestry and agroforestry.

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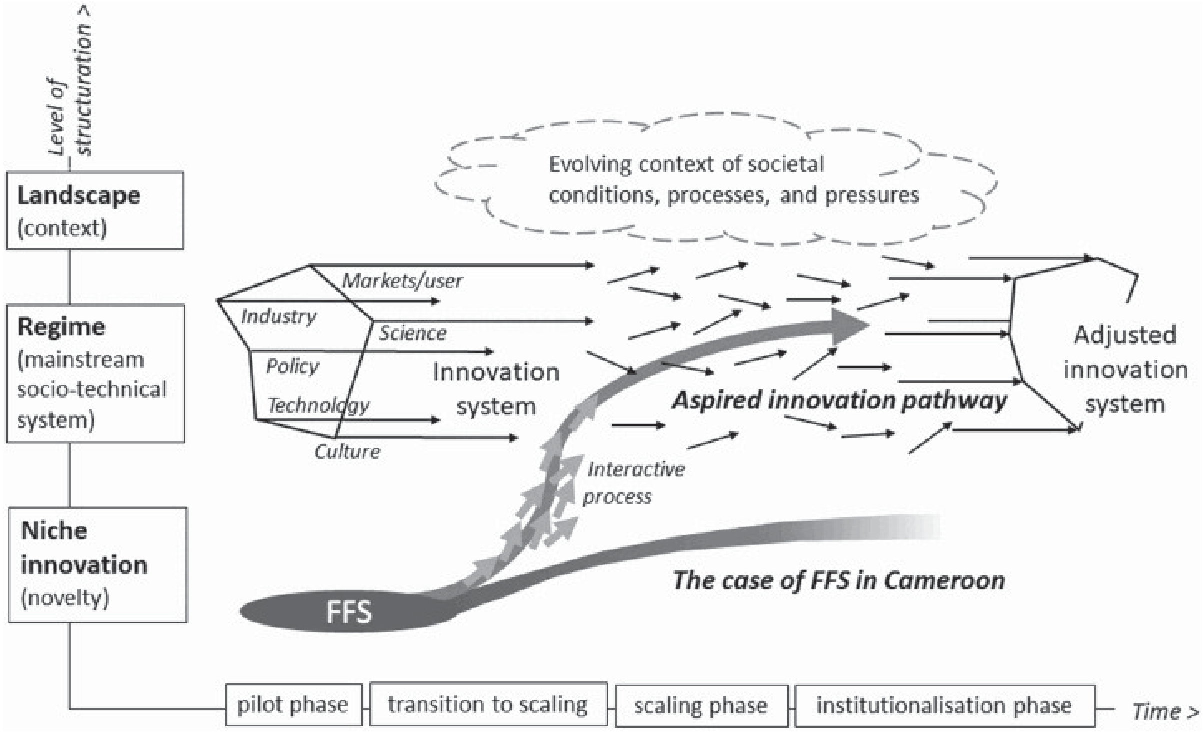
[10] A more thorough, elaborate summary of this argument can be found in Sherwood, Van Bommel and Paredes, 2016.

Muilerman, Wigboldus and Leeuwis (2018) studied the performance of the Sustainable Tree Crops Programme in Cameroon as an example of a PPP that lasted from 2001 to 2010. Despite initial hopes and expectations as well as considerable investment and effort, the researchers found that the programme did not lead to large-scale institutionalization. As explained in Figure 4, when the FFS began to move from a niche-level innovation to the wider systemic and landscape level, a number of administrative, organization and institutional factors interfered with its expansion. Based on a review of documents and an interview, the researchers concluded that greater influence and institutionalization outcomes were impeded by the lack of an adaptive approach to scaling the FFS curriculum, limited investments, and weak buy-in by extension actors, who ultimately converted FFS and utilized its approach for other purposes. In particular, extension agents failed or refused to adapt management approaches necessary for user-centred content and implementation between the pilot and the scaling phase. These findings suggest that successful scaling of FFS on forestry pilot initiatives is not a function of linear roll-out; instead, their meaningful growth requires continual quality control and adaptation to particular contextual and institutional conditions.

Figure 4. The scaling up of a cacao farmer field school in Cameroon


Level of structuration >
Landscape (context)
Regime (mainstream socio-technical system)
Niche innovation (novelty)
Evolving context of societal conditions, processes, and pressures
Markets/user
Industry
Science
Policy
Technology
Culture
Innovation system
Aspired innovation pathway
Adjusted innovation system
Interactive process
The case of FFS in Cameroon
FFS
pilot phase
transition to scaling
scaling phase
institutionalisation phase
Time >

Source: Muilerman, S., Wigboldus, S. & Leeuwis, C. 2018. Scaling and institutionalization within agricultural innovation systems: the case of cocoa farmer field schools in Cameroon. *International Journal of Agricultural Sustainability*, 16(2): 167–186. https://doi.org/10.1080/14735903.2018.1440469

Similar challenges were found when attempting to integrate production-oriented FFS within institutions in Latin America (Sherwood, Schut and Leeuwis, 2012). As explained earlier, in seeking to place farmers at the centre of knowledge production and decision-making side-to-side with other key stakeholders in the food system, approaches such as FFS do not always align with conventional approaches to agricultural research and extension. When scaling up FFS and handing them over to brokers of agricultural knowledge, science, technology and development, FFS sometimes lost its key elements, in particular by reducing social processes of change to technical packages. Organizations used administrative measures to focus FFS on their priorities over those of the participating farmers; coordinators began to find it more expedient to predetermine content and curricula; facilitators gave answers instead of asking questions; and experiments became demonstrations. The predominantly technical application of the action-learning process stripped the FFS of its meaning.

There is a long history of innovations in regenerative agriculture and natural resource management (e.g. organic agriculture, agroforestry, agroecology, permaculture, community-based natural resource management) and people-centred development (farmer-to-farmer, participatory technology development, and FFS, among many other salient examples) that are yet to be fully consolidated into stable institutional forms. Despite decades of emerging evidence of alternative possibilities fuelled by challenges emerging in current systems and practices, it is still difficult to create new food and agriculture systems that integrate these practices, i.e. redefine what is best practice in training, farming and forestry.

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7. MAIN FINDINGS AND RECOMMENDATIONS

While initially developed to address concerns over intensive rice production in Indonesia, over the last 35 years, rural families, communities and support agencies have adapted the FFS approach to tackle other challenges in rural development and sustainable natural resources management, including ecosystem restoration. Resulting from this stocktaking, the diversification of FFS began in the 1990s and has led to manifold forestry-related applications, including fruit tree production, agroforestry, conservation agriculture, climate change adaptation, and to a lesser extent, the management of landscapes, watersheds and natural forests. Most recently, a growing network of farmers and technicians involved in regenerative agriculture has been drawing heavily on specialized knowledge of forest soils to inform agricultural development that effectively renews farming as a source of carbon cycling and sequestration for the purposes of climate change mitigation. Due to the emphasis on the use of trees in food production, this collective action-learning movement is referred to here as FFS on agroforestry and forestry.

In light of the diverse experience of FFS on agroforestry and forestry found across regions of the Global South, the stocktaking explored the following interacting questions:

- Experience to date: What is the experience in applying the FFS approach to community and smallholder agroforestry?
- Insights: What special understanding can be gained from FFS on forestry and agroforestry experience for strengthening forestry and agricultural extension?
- Promising next steps: What opportunities remain for a strategic collaboration between smallholder forestry/agroforestry and agriculture extension?

Finally, based on the findings of this stocktaking, a number of recommendations are highlighted as promising next steps for bringing to bear the experience of FFS on forestry and agroforestry in advancing participant learning and innovation, as well as needed institutional change for greater people-centring in rural development, natural resources management and ecosystem restoration.

7.1 Main findings of the stocktaking

1. Work to date: FFS on smallholder forestry and agroforestry

FAO estimates that over 20 million participants in every region of the Global South have taken part in an FFS (FAO, 2019). Since their development in the rice fields of Indonesia in the late 1980s, the FFS approach has thematically diversified to include new production issues, crops, animals and integrated production systems before branching out to include landscape management, human health and governance.

Given the lengthy and diverse history of the FFS, it was not realistic to produce an exhaustive list of forestry applications. Still, due to the relevance of trees in smallholder farming, wherever the FFS has been in practice for more than a few years, programmes have experimented with an agroforestry application. In interviews and in the documentation, no FFS focused on conservation, while there was a diversity of FFS on agroforestry applications, some relatively minor and experimental (e.g. in Ecuador), and others, major (in the Philippines, Honduras and Kenya) (Box 6).

Hundreds of examples in many contexts show that FFS can help farmers advance their learning and innovation in multiple aspects of agroforestry. Given the extensive and diverse applications of FFS to forest-related systems, there are many resources on which to build a strategic alliance between FFS and CBF practices. There is a wealth and diversity of FFS curricula, lesson plans and testimonies on different forestry aspects and geographic, environmental and social contexts to inform present and future activity.

Nevertheless, trees, forestry and perennials raise unique challenges for a discovery-learning methodology that had emerged for annual crops. Sustaining motivation throughout the FFS sessions was a unique challenge for perennial crops that can take decades to produce an economic return. Moreover, given growing climate variability across the planet, perennials, trees and herbaceous plants are of heightened importance. Following a study of several FFS on agroforestry pilots in Aceh, Sumatra and Java, Indonesia from 2004 to 2010, Wienarto *et al.* (2012) found that the success of an FFS on agroforestry depended on "proper sequencing, designing participatory activities that promote learning and allow learners to draw upon their experience and knowledge and finding a useful hook to generate interest at the beginning". Their FFS captured people's attention through the threat of quality loss in potable water.

There is a vast opportunity to increase the profile of trees in food and fibre for stabilizing production; deep-rooted herbaceous plants, bushes and trees tend to be less vulnerable to acute and chronic water shortages. Perennials and trees can help stabilize soils, conserve humidity, and prevent wind erosion, among other ecosystem functions such as climate change mitigation and ecosystem restoration. The problem of the low profile of perennials in today's family farming is not due to a lack of opportunity, but rather a conflict between tree-based production systems and the predominant short-term profit orientation that dominates modern agriculture.

Among scientists specialized in IPM, soil and water management, climate change and economics, there is a growing international call for further integrating trees and other aspects of environmental conservation into agriculture, in particular through the development of agroforestry systems (see, for example, Lohbeck *et al.*, 2020). While there has been substantial experimentation with trees and forestry ideas in smallholder farming, it is clear that a narrow production focus on annual crops informs and guides the activity to date of FFS. When trees have been the focus of an FFS, the curriculum has primarily focused on improving fruit tree production as a complementary activity through fertilization, pruning and IPM.

When used to promote technologies, however, the user-centred, action-learning process of the FFS programmes has been frequently transformed to the extent that it has become challenging to distinguish it from more techno-centric designs. In some cases, researcher-led FFS have followed the same tendency. The literature and interviews identified process-related concerns over FFS on agroforestry, conservation agriculture and CSA. Although applying the FFS approach to these fields is undoubtedly urgent, a challenge has arisen that must be addressed: a review of the content of curricula and the testimonies of participants revealed that the application of the FFS in topics such as forestry, agroforestry and CSA follow, in some cases, the pre-determined practices led by experts, deviating from the farmer-led learning and experimentation that characterize the FFS. Greater balance is called for if this work is to unleash and catalyse the longer-term social potential of FFS, in particular concerning creativity and self-organization. Quality control is an ongoing challenge.

Ex-post reviews have raised questions about the sustainability of expert-driven FFS in adopting practices, improvements in production or productivity, income generation, participant enthusiasm, and the ability to self-finance. These particular FFS did not emphasize leadership or social organization, either by strengthening an existing group or helping to form a new one. Notable exceptions are highlighted, as in the cases of the industry-supported producer organizations in the tea sector in Kenya (Waarts *et al.*, 2012) and in the coffee sector in Brazil (Civera, de Colle and Casalegno, 2019).

2. Insights: strengthening forestry and agricultural extension

a. Transformation from the grassroots up: FFS is not the only available or best action-learning approach, especially when it is difficult to bring together users in action-learning groups. This was the case for disparate migrant populations of families distributed across the islands of the Galapagos Archipelago; hunter-gathering families of the Sápara, distributed across around 385 000 ha of remote Amazon forest; displaced forest dwellers in Mozambique; and nomadic pastoral communities that migrate across vast regions of Africa and Asia. However, the FFS experience can fuel a powerful transformative dynamic that can continue across a generation, such as the experience of the IPM groups in Indonesia and other parts of Southeast Asia, which evolved to tackle watershed, landscape and even regional-level development concerns.

Despite a long history of helping local families and communities to gain access and control over forest resources, in many countries, capacity building and forestry extension services have been weakened or terminated due to various constraints (economic, social and political) and have left many communities and smallholders unattended. Addressing the current global challenges (e.g. sustainable production, climate change mitigation, ecosystem restoration) requires the active participation of communities and smallholders, and urgently requires bringing back and investing in capacity-building and extension programmes to enhance technical capacities and farmer-lead experimentation. The work in FFS is unique in its ambition to establish a well-structured, time-tested learning approach that has proven to be robust in diverse thematic and geographic applications. As identified in countries across the Global South, when fully applied to forestry concerns, FFS has demonstrated to be a potentially powerful platform for sharing experience, fostering ecological literacy, and promoting group experimentation, group formation and social learning (van den Berg *et al.*, 2021; Davis *et al.*, 2012).

b. Local capacity and inclusion: While the diverse experiences in FFS on agroforestry in places such as Indonesia, Kenya and Central America demonstrate the potential of ecological literacy and farmer-led experimentation in perennials, the available documentation is less clear on the ultimate contributions to local capacity building in terms of the extent and quality of farmer-led knowledge production, technology development, leadership and social organization. Due to the inherent lifespan of perennials, the introduction and management of trees in a model of production such as farming, which de-contextualizes ecosystems and prioritizes short-term production, create an inherent challenge for experiential learning. Due to the biological complexities and unpredictability of farming, there are continuous challenges for knowledge production in annual farming. In some agroforestry cases, such as the Cosmopolitana in Colombia, although the complexities are very much greater, there are also opportunities for creative problem-solving.

Wienarto *et al.* (2012) found that, similar to IPM, FFS on agroforestry in Aceh, Sumatra and Java proved an excellent opportunity to identify and develop community leaders, and provide them with technical training and project support. They also found that graduates were inspired and well positioned to carry on a legacy of community-based natural resource management.

Confronted with the challenge of perennials, many FFS programmes chose to stretch out the sessions across an extended period of 12–18 months, which can tax a group’s attention, as seen in forestry management in India. Where possible, the chronosequence approach applied in Ecuador may be an effective alternative. In addition, initiatives such as CSA in Africa and Central America integrated annual cropping with perennials to keep the FFS experience timely and relevant while also addressing the unique demands of longer-term, discovery-based, self-directed learning about forestry.

Without being able to observe FFS in the field for the specific purpose of this stocktaking, it was not possible to critically assess the inclusion in FFS of traditionally marginalized people and sectors, such as the lower social castes, the landless, women and girls, nor contributions to self-esteem and leadership development. Groups in Nepal stated that the FFS on CBF helped to strengthen FUGs, but no information was available on the details of how that was achieved, or what strengthened FUGs may have achieved as a result of their FFS experience. Initiatives in East Africa, for example, closely monitored the presence of women in activities, but there was no critical assessment of their empowerment. At the minimum, FFS on agroforestry programmes generally acknowledge the importance of social inclusion, even if achieving it can sometimes be elusive.

c. Partnerships and networks: When asked about the single most important contribution of the FFS, some respondents pointed to its ability to promote leadership and social organization. The limitations of the stocktaking made it difficult to assess how such groups in FFS on agroforestry engaged and interacted with other actors and stakeholders, for example, in landscape, watershed and broader natural resource management. Similarly, interviews showed that enabling traditional FFS to go beyond the farmer’s field and community, and to work with other communities and government officials was the single most important contribution of the integrated rice and landscape initiatives. Over time, this led FFS graduates to contribute to management plans and to make direct contacts with universities, NGOs and development partners for further innovation, learning and upscaling.

The extensive documentation of FFS work in Central America and Mexico dedicated little attention to social organization and partnerships. Nevertheless, a coordinator of a collaborating producer organization on the north coast of Honduras stated that FFS greatly helped to consolidate its work and to “bring farmers up to same speed” in farm management and produce quality. He argued that the high-quality technical advice helped his colleagues to be successful in coffee and cacao production, which provided a much-needed “injection of success” into their work. As a result, the producer organization grew and strengthened its ability to negotiate contracts with purchasers – achievements not attained prior to the arrival of FFS.

Practitioners working with FMNR in West Africa and similar landscape/ecosystem restoration approaches raised concerns that long-time FFS practitioners could be overly attached to FFS, and thus focus on trying to fit it into landscape approaches rather than exploring other organizational approaches that were better suited to these scales. A few colleagues with extensive background in CBF similarly felt that community-based natural resource management was better suited to address more complex, multi-community and multi-stakeholder concerns. Other practitioners explained how, upon moving from field-level IPM to landscape management, integrated FFS programmes were able to continually experiment in process management, incorporating different tools and instruments along the way. This innovation led to modifications in the organizational structure and processes of FFS, similar to the regional FFS structures common in places such as Indonesia. In summary, taking FFS to new geographic scales requires creativity and openness to new ways of working and organizing.

FFS on agroforestry work contributed to the objectives of research organizations such as the Center for International Forestry Research (CIFOR), the International Livestock Research Institute (ILRI) and CATIE, United Nations agencies (e.g. FAO and IFAD), development organizations (notably JICA and USAID) and the private sector (e.g. businesses of Unilever, Lipton, Neumann Kaffee Gruppe and Terrafertil/Nestlé). Each partnership introduces complexities and risks, but can also contribute new human, material and financial capital for institutional change.

3. Promising next steps: collaboration between forestry and agriculture extension

Despite decades of the work in CBF that began in the 1970s, during interviews, a number of respondents expressed frustration over the recent neglect of forestry extension. Familiar with the work in farmer-to-farmer learning and experimentation, they viewed collaboration with FAO's FFS team, specifically in strengthening the application of the FFS approach to forestry and agroforestry, as an opportunity to inject fresh energy into forestry extension. In addition, workers in crop production saw an opportunity to work with foresters in order to: increase the profile of trees and other annual crops in agriculture; respond to the need of creating income-generating opportunities, and address labour shortages in rural areas; assure food security in an era of growing climate uncertainties; recover soil biomes; re-carbonize soils; and ensure overall ecosystem restoration.

Today, progressive movements in agriculture, food and nature conservation are involved in a transition out of conventional agriculture, which opens up space for new forms of "response-ability". Given the long experience in people-centred development, how can the networks involved in FFS and forestry join forces in extending institutional transition and extension services towards more productive, sustainable and equitable agriculture and natural resource management?

CBF, FFS and other user-centred approaches depend heavily on local leadership. Over the last 30 to 40 years, the work has been rife with testimonies of the significant impact of work carried out by local female and male leaders and promoters. There is some evidence of the impacts of FFS on agroforestry on the incomes and yields of participating farmers. See, for instance, Galeb *et al.* (2021) on the impact of the Andhra Pradesh natural farming programme, Martini *et al.* (2016) on FFS on agroforestry on clove, pepper, coffee, cacao and durian in Indonesia, and Waarts *et al*. (2012) on the impact of FFS on tea in Kenya. However, well-designed impact assessments of FFS on agroforestry and forestry are still rare, and still tend to focus on easy-to-measure indicators such as income and yields, as opposed to exploring soil health, climate resilience, farmers' health and other impact indicators that are harder to measure. By leveraging their respective influence, a CBF-production agriculture collaboration can ensure that greater attention is invested in local agencies and organizations, village structures, producer organizations, local government, or other collective entities. It is necessary to choose partners wisely, and it is essential to identify local leaders and work closely together to leverage needed institutional change from within each organizational space. Beyond the scale of the impact, attention is drawn to the need for more strategic investment in *quality* over size.

The present-day pressure on scaling, commonly understood as increasing social influence through "extensivity" (i.e. growth in number and volume of activity), overlooks what FFS arguably best achieves: growth in depth and quality, or "intensity". As experienced in Latin America, FFS is at risk of growing in size but not in meaning (Sherwood, Schut and Leeuwis, 2012). In contrast, a small, high-quality example can have a significant impact. While several organizations have invested significant energy in increasing the reach of the FFS approach to around 20 million farmers (van den Berg, 2021), this increase should not come at a cost in quality, in particular, concerning user-centring, unlocking local creativity, problem-solving and building organizational capacity.

There are substantial implications of collaboration for people-centred development to bridge the gaps in forestry and agriculture extension, especially for smallholders, communities and producer organizations. When successful, FFS can help local actors by enhancing their local "response-ability", i.e. by de-centring knowledge production while creating a context for competent, problem-oriented leadership and democratic social organization that are linked to a number of biological innovations in food production and natural resource management. This stocktaking presented interesting cases (e.g. los Aliados in Ecuador, FENAPROCACAHO in Honduras, PHBM in Indonesia) on how FFS can help farmers build their ecological knowledge production while creating a context for competent, problem-oriented leadership and social organization that are linked to innovations in natural resource management and food production. In particular, this entails the reduction of external inputs, soil disturbance, and the promotion and inclusion of trees and perennials to agriculture, and collectively contribute to climate change mitigation, sustainable production and ecosystem restoration.

7.2 Recommendations

FFS on forestry and agroforestry strongly emerge as an opportunity to unite and strengthen a number of historically diverse yet similar initiatives. During this stocktaking, there were numerous suggestions for strengthening process-oriented work through the FFS approach based on insights drawn from working with trees and forests.

The high-level recommendations below emerged from the stocktaking.

1. Mobilize resources for immediate implementation and expand the influence of FFS programmes. Development partners, governments and policymakers should allocate resources needed to build collective capacities for more regenerative agriculture and forestry, such as CBF and FFS. Focus should be placed on investing in a decentralized network of like-minded, autonomous networks of actors who share a vision, competencies and commitment, and are capable of creatively navigating their context for solutions. Putting FFS to work for people-centred development requires supporting transitions of extension and forest services from top-down, one-way advice to participatory approaches, facilitating rural platforms that co-produce solutions and in which producers contribute to knowledge generation and advisory services together with forest and agricultural services. Left unmanaged, the learning process of FFS can be interrupted, for example, by excluding farmers from the design of learning content.

2. Seek empowerment of forestry and agroforestry smallholders through direct, self-guided experience within FFS, and place it in the front and centre of social change and development. As a body of practice, FFS has accumulated extensive experience in adult learning, particularly regarding process management, which could strengthen CBF. Opportunities lie in enhancing users' engagement in curriculum development and promoting ecological literacy through discovery-based education in the fundamentals of biology and farmer-led experimentation.

In FFS, the focus on independent thinking and feeling is strategic. Practitioners, facilitators and the FFS community should help farmers shift from being mere beneficiaries to being active problem-solving agents capable of critical reflection, purposeful experimentation and social organization. This also includes the empowerment and systematic involvement of women as participants and new leaders in forestry learning and innovation.

3. Systematically and strategically include women and youth as participants and new leaders in forestry learning and innovation. Women, girls and youth play an important role in the forest sector, not only in livelihood activities at the community level, managing and conserving forests, but also in productive and income-generating initiatives such as agroforestry production. However, girls and women continue to be systematically excluded from the benefits of forestry production.

Young girls and boys are moving away from rural farms to urban areas due to the lack of income-generating opportunities in their place of origin and a lack of interest in working in agriculture. Just as in IPM in Southeast Asia and in Dimitra clubs that promote women's empowerment, development partners, practitioners and FFS on forestry and agroforestry, the community should strengthen the position and participation of women and youth in forestry access and resource utilization for both conservation and economic development. Involving women, youth and girls in forestry and FFS-related activities is particularly strategic due to their knowledge of biodiversity, plants, cooking, family diets and health.

Local business and income-generating activities should be integrated into FFS and community initiatives. Generating financial returns can help inspire and sustain increasing investment in farmer-led rehabilitative and restorative activities. Developing opportunities for marginalized segments of the population, such as women, youth, children and landless people, is key to counter the continual emigration of youth to urban centres and brain and labour drain.

4. Curate FFS experiences in regenerative agriculture and agroforestry. The programmes identified in this stocktaking would benefit from the documentation of the diverse learning exercises and experiments that have effectively promoted ecological literacy in fundamental biology and other critical elements that have enabled participants to rehabilitate agriculture and forestry.

Documentation of pilots across the regions would help build a repository of experiences on which current programmes could strengthen their curricula. FAO, the Global FFS platform and the FFS community can provide support in identifying outstanding FFS graduates and forestry and agroforestry practitioners for further training and invest in their proposals to strengthen leadership and organizational capacities, feeding into farmer-to-farmer knowledge transfer and innovation. The Transboundary Agro-Ecosystem Management Project for the Kagera River Basin (Kagera-TAMP) funded by the GEF provides important experiences and lessons learned from the work with smallholder farmers in sustainable land management. The ongoing GEF-funded Sustainable Forest Management Impact Program on Dryland Sustainable Landscapes project in southern Africa, implemented jointly by FAO´s partnership with the World Bank, the International Union for Conservation of Nature (IUCN), UNEP and the World Wildlife Fund (WWF), could provide globally relevant lessons for dryland areas. Insights from similar learning approaches in agroecology, agroforestry, permaculture and analogue forestry movements in the Americas may provide valuable examples for teaching. In addition, it may be helpful to pilot interactive online learning to build the capacity of a cohort of FFS forestry and agroforestry practitioners, following the example of the virtual course in FFS on livestock (FAO, 2021).

5. Scale up through both inward and outward growth. Highly situated problem-solving is just as important as technology transfer for development. Like other people-centred, knowledge-intensive approaches, FFS must continually emphasize quality – not just in increasing production, but also in productivity, the biological/ecological performance of alternatives, leadership development and social organization. By design, each FFS experience needs to be unique in context, curriculum, thematic development, and most notably, participant ownership and utilization of the experience. To thrive in influence and impact, FAO, development organizations and governments can support the FFS approach in enabling an adequate institutional environment with its own set of rules for good practices in development programmes capable of catering to the demands of user-centring, participation and local control over the action-learning process.

6. Integrate polycultures and agroforestry for greater food security, soil health and land restoration. For FFS facilitators, agroforestry presents the challenge of greatly expanding the classical curriculum's cross-scale, biological and ecological complexities. Working with perennials raises the need to address longer time scales and broader spatial relations, posing a challenge for the traditional FFS learning curriculum oriented around annual crops. Yet, it also opens up opportunities for taking the FFS approach to new realms of technical application. FFS can help participants understand the need for investment in long-term ecological processes, and co-design the most effective tactics and strategies at landscape levels. However, given the length of return on investment and the relevance to restoring global common-pool processes such as climate, financial incentives may be needed to compensate the participant's contribution to environmental services.

Although stacked polycultures can take time to establish, they offer some of the best opportunities for stable food and fibre growth for food security while maximizing photosynthesis for above- and below-ground biomass accumulation. This can help restore soil microbiology and plant symbiosis, leading to immediate benefits in crop health and production, as well as longer-term carbon accrual needed for climate change mitigation. Within the support of development partners, FFS community, practitioners and FFS on forestry can bring an important opportunity to enable small-scale producers and family farmers to unfold their collective potential to advance towards the achievement of the Sustainable Development Goals (SDGs) and to become leading players in climate change mitigation and ecosystem restoration.

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GLOSSARY

Action-learning: First employed in business and organization development, in the context of rural development and conservation, action-learning involves group engagement with real-life problems. The focus is not only on end results, but also teamwork and the learning process, particularly regarding doing and reflecting. Over time, action-learning can help a community tackle increasingly difficult and even seemingly intractable challenges.

Agriculture: In this report, agriculture refers to crops, livestock, fisheries (capture and aquaculture) and forestry. There is a distinction here between corporate-owned, industrial modes of food and fibre production, and family and community agriculture. In line with FAO's priority family- and community-based modes of production are strategically emphasized.

Agroecology: Agroecology is a holistic and integrated approach that simultaneously applies ecological and social concepts and principles to the design and management of sustainable agriculture and food systems. It seeks to optimize the interactions between plants, animals, humans and the environment while also addressing the need for socially equitable food systems within which people can exercise choice over what they eat and how and where it is produced.

Agroforestry: Nair (1993) recognizes 18 different agroforestry practices. Generally, this term refers to either simultaneous integration of perennial woody species in crop or animal production systems (e.g. coffee-shade systems), or the sequential alternation of annual crops and trees (fallow systems). Leakey (1996: 7) defines agroforestry as "… *a dynamic, ecologically based, natural resource management system that, through the integration of trees in farm- and rangeland, diversifies and sustains smallholder production for increased social, economic and environmental benefits*".

Analog forestry: Analog forestry is an approach to ecological restoration that uses natural forests as a guide to creating ecologically stable and socio-economically productive landscapes. By fostering ecological function for resilience and productivity, analog forestry is a holistic form of silviculture that seeks to minimize external inputs, such as agrochemicals and fossil fuels.

Chakra: *Chakra* is a form of agroforestry and permaculture that involves the cultivating of multipurpose crops, trees and even raising animals, including wild species.

Community: Sociologists commonly understand a community as a group of people who share a common geography and interact socially. For FFS on agroforestry, a community can also be understood as a group that shares a common structure (i.e. a patterned way of organizing, thinking and doing). People may work together to organize social life within a particular place and may be bound by a shared sense of identity, history or belonging, sustained across time and space.

Community forestry: FAO (1978) initially defined community forestry as:

> *any situation which intimately involves local people in a forestry activity. It embraces a spectrum of situations ranging from woodlots in areas which are short of wood and other forest products for local needs, through the growing of trees at the farm level to provide cash crops and the processing of forest products at the household, artisan or small industry level to generate income, to the activities of forest dwelling communities.*

Community forestry involves the management of forest resources by the local communities, including indigenous processes or government-led initiatives.

Community-based forestry (CBF). CBF includes "initiatives, sciences, policies, institutions and processes that are intended to increase the role of local people in governing and managing forest resources" (Gilmour, 2016). It also includes formalized customary and indigenous processes as well as government-led initiatives. It may involve decentralized and devolved forest management, smallholder forestry schemes, community-company partnerships, small-scale forest-based enterprises, and indigenous management of sacred sites of cultural importance.

Ecological literacy: In the context of field schools, ecological literacy refers to the ability to recognize and work with basic biological and ecological principles involved in plant (re) production for the purposes of agriculture, such as genetics, reproduction and photosynthesis, as well as the processes involved in interactions with other organisms, such as insects (i.e. life cycles, metamorphosis, parasitism) and microbes (i.e. mineralization, N-fixation, fermentation). More recently, ecological literacy has been extrapolated to include broader environmental phenomena, such as weather and climate. David Orr (1992) is commonly credited with coining ecological literacy, in the mid-1980s and plant protection specialists at FAO in Indonesia (Kenmore *et al.*, 1987) and at the Pan American School of Agriculture in Honduras (Bentley, 1989) began to actively apply it to help farmers fill knowledge gaps and experiment.

Ecological restoration: This refers to the science and art of recovering a degraded, damaged or destroyed ecosystem to the point of stable component functioning, ecological integrity, and resilience against normal environmental stresses (Miccolis *et al.*, 2016).

Ecosystem restoration: Sometimes used interchangeably with "ecological restoration", according to FAO and the United Nations Environment Programme (UNEP), ecosystem restoration in production systems encompasses the continuum of practices that contributes to conserving and repairing damaged ecosystems. Considering the severe damage that agriculture, forestry and other human activity have inflicted on ecosystems across the planet, ecological restoration seeks to recover, recuperate and renew farms and landscapes to a healthy and stable state for sustainable food production and livelihoods. It also seeks to optimize the biological interactions and complementarity between plants, animals and the environment, particularly for historically marginalized peoples.

Family farming: This refers to all types of family-based production models in agriculture, fisheries, forestry, pastoral and aquaculture, including those that peasants, Indigenous Peoples, traditional communities, fisherfolk, mountain farmers, forest users and pastoralists create. FAO (2019) recognizes that family farming is the predominant form of food and agricultural production in developed and developing countries, producing over 80 percent of the world's food in value terms.

Farmer field school (FFS): First developed by a group of people working with an FAO project on rice pest management in Indonesia in the late 1980s, the FFS is a learning-action approach built on principles of adult education. In particular, it is user-centred, experiential learning linked to fundamental biological and ecological processes involved in crop production, such as insect metamorphosis and beneficial interactions, plant nutrient cycling and photosynthesis. By design, facilitators connect the learning to the crop's phenological growth stages. Later, FFS diversified from various crops to fruit trees, animals, integrated production systems, and even human nutrition and social and governance concerns.

FFS on agroforestry: FFS on agroforestry focus on agricultural production-oriented activities. These may include aspects of integrated annual crop and perennial tree production, fruit tree and plantation management in family farming, and soil conservation, as well as climate change adaptation initiatives.

FFS on forestry: FFS on forestry refers to the adaptation of the field school approach to a broad array of tree applications for either an economic or environmental purpose. This may include natural forest management, afforestation, and woodlots and community-based forest, landscape and watershed management, as well as initiatives for longer-term climate change mitigation.

Forest: This report uses the term "forest" to refer to all land where the tree canopy covers more than 10 percent of the area, including primary, secondary and planted forests, mangroves and integrated agroforestry systems.

Forest and Farm Facility (FFF): The FFF is a partnership established in 2012 between FAO, the International Institute for Environment and Development (IIED), the International Union for the Conservation of Nature (IUCN) and AgriCord.

Forest and farm producers: These producers are women and men, smallholder families, Indigenous Peoples and local communities with a strong relationship with forests and farms in forested landscapes. These producers grow, manage, harvest and process a wide range of natural resource-based goods and services for subsistence use and sale in local, national and international markets (FAO, 2014b).

Forest and farm producer organizations (FFPOs): These formal or informal producer associations may be created for multiple purposes, including: sharing knowledge and experience; engaging in policy advocacy; securing tenure and access rights to forest, land and other natural resources; improving forest and farm management; expanding markets; building enterprises; and increasing income and well-being. FFPOs vary widely in size and institutional form, and may focus on forests or combinations of forest- and farm-related activities. They may include Indigenous Peoples and local community organizations, tree-grower and agroforestry associations, forest owner associations, cooperatives, rural enterprises, and umbrella groups and federations (ibid.).

Good agriculture practices (GAPs): Originally developed by the food industry in order to meet hygiene standards, GAPs are voluntary guidelines for farmers to reduce the risk of microbial contaminations tied to food-borne illnesses on their farms as well as pollution from pesticides and heavy metals. Over time, the GAP concept has diversified to include other concerns, such as risk reduction in pesticide use, agrobiodiversity management, and soil conservation.

Industrial production: Industrial production is an industrialized form of farming characterized by mechanization, monocultures, and the use of synthetic inputs such as chemical fertilizers, pesticides and genetically modified organisms (GMOs), with an emphasis on maximizing productivity and profitability, and treating the farm produce as a commodity.

Institutions: From a sociological perspective, an institution can be understood as either: (i) a stable pattern of behaviour or practice that defines or normalizes, governs and constrains action, for example, in the family, the field of work, the neighbourhood, a network or community; or (ii) an organization or other formal social structure that governs a field of action.

Institutionalization: In sociology (i.e. the study of the way society is organized), institutionalization is the process of normalizing a belief, role, value or behaviour in an organization, social system or broader society. Institutionalization takes place in daily routines and practices, and is administered by actors in communities, agencies, government and private industry, determining, for example, "the rules of the game" and best practice, in this case, in farming, forestry, conservation and development practice.

Modernization: Rural sociologists identify modernization in agriculture and natural resource management as a historical event beginning in the 19th and 20th centuries, involving the introduction of at least three impactful yet arguably harmful innovations over the long term: (i) the commodification of life and the introduction of currency and financial systems as the principal means of intermediating relationships; (ii) the physical and social distancing of markets (leading to the creation of the anonymous "consumer" and "producer"); and (iii) dependence on externally based knowledge and technology (van der Ploeg, 2003).

Non-timber forest products (NTFPs) and non-wood forest products (NWFPs): NTFPs refer to any product or service other than timber that is produced in a forest. This may include fruits and nuts, vegetables, fish and game, medicinal plants, resins, essences, and a range of barks and fibres such as bamboo and rattans, and a host of palms and grasses. NWFPs may overlap and be similar to NTFPs, except that NWFPs exclude all wood products.

People-centred development: This is an approach to social change based on investing in individuals and collective capacities to enhance self-confidence and –reliance, and to more directly and independently represent and advance interests.

Perennial crops: While perennial crops typically refer to the inclusion of woody and shrub species in agriculture and other managed ecologies, researchers have recently been seeking ways of increasing the profile of herbaceous perennials, such as grains and oilseeds. In the last decade, there has been growing interest in increasing the profile of perennial species in agriculture and food and fibre production as a means of correcting the ills of industrial farming, in particular for agricultural diversification, risk management and mitigation.

PHBM (Pengellaan Hutan Bersama Masyarakat): PHBM, or "managing forests with the community", is a process of sharing land and rights to harvest NTFPs. In 2001, introduced by the Indonesian state-owned forest agency in Java, Perum Perhutani, PHBM aims to increase and more clearly define the rights and responsibilities of farmers engaged in intercropping and agroforestry. Through benefit cost-sharing and combining forest vegetation and multipurpose trees in the *Gunung Lasem* forest area, Central Java, PHBM provided local dwellers with greater access to non-timber forest resources (Fujiwara *et al.*, 2012).

Regenerative agriculture: Regenerative agriculture is described as a joint conservation and rehabilitation approach to food production that borrows from a series of farming principles and practices that utilizes photosynthesis to concurrently increase biodiversity, enrich soils, improve watersheds, and enhance ecosystems. Coined by the Rodale Institute in the 1980s, regenerative agriculture was further developed by pioneering farmers in such diverse locations as Pennsylvania, Australia, India and Zimbabwe. The approach draws on decades of experience in organic farming, agroecology, holistic grazing and agroforestry, among other non-industrial means of production.

"Response-ability": Beyond the moral and ethical call for responsibility in food, agriculture and natural resource management, drawing on the work of biologist and feminist scholar, Donna Haraway, socio-biological "response-ability" refers to an embodied socio-biological sensibility to feel and act in concert with one's context or environment.

Social forestry: Hyde and Köhlin (2000) define social forestry as the management of a forest and its products and services for the benefit of its denizens, in particular, women and the rural poor, especially landless users of the forested commons. Social forestry may include aspects of forest protection, afforestation and exploitation to advance the rural, environmental and social well-being of a people and its community.

Social learning: Niels Röling (2002) summarized social learning as the movement from multiple to collective or distributive cognition, for example, in food production or natural resource management. Hence, social learning is the process by which actors acquire the awareness, experience and relationships necessary to become actively involved in the collective enterprise of adaptive management and other routines. As Röling explains, social learning involves the ability to mediate and manage complex tensions between coherence (i.e. the ability to coordinate and work together) and correspondence (effectively addressing socially and environmentally relevant activity).

Trees outside forests (TOF): Depending on context, TOF refers to small tree stands of less than 0.5 ha or areas of less than 10 percent tree cover, including on farmlands and built-up areas in both rural and urban areas (FAO, 2001). A large number of TOF consist of planted or domesticated trees, including in agroforestry systems, orchards and small woodlots. They may grow in meadows and pastoral areas, on farms, along rivers, canals and roadsides, or in towns, gardens and parks. Some of the land-use systems include alley cropping and shifting cultivation, permanent tree cover crops (e.g. coffee, cocoa), windbreaks, hedgerows, home gardens and fruit tree plantations.

ANNEX 1: MODE 1 (EXPERT-LED) AND MODE 2 (PRACTITIONER-LED) KNOWLEDGE PRODUCTION

Criterion	Mode 1: Knowledge produced in the context of abstraction	Mode 2: Knowledge produced in the context of application
Nature of knowledge production	Theoretical – produced from within a disciplinary community	Practical – produced from within a problem context
Bias – rules that govern conduct	Disciplinary and multidisciplinary – single or multiple system of rules determining conduct	Transdisciplinary – dynamic, multiple systems of interaction, which are influenced by each other
Problem-solving – experience and skills employed	Homogeneous – focused, well-defined experience and skill sets	Heterogeneous – diverse experiences and skills involved
Organization structures	Centralized and hierarchical – well-established, graded and top-down	Diverse and heterarchical – loose, flexible and fluid structures; mixed and dissimilar constituents
Negotiation and consensus – resolution of differences	Closed and slow – conditioned by pre-established norms and rules	Open and transient – conditioned by the context of application and evolving with it
Nature of knowledge	Generalized and cumulative	Context-specific and dependent on locality
Social accountability and reflexivity	Low – offer-oriented and exclusive with low sensitivity to the impact of outcomes; preoccupied with internal criteria and priorities	High – demand-oriented and inclusive with high sensitivity to impact of outcomes; preoccupied with relevance
Quality control – encouragement of "good science"	Centrally defined – the peer-review system; peer-selected and based on compliance with norms; emphasis on individual creativity from within disciplinary bounds	Broadly based – composite and multi-dimensional; dependent on the social composition of a review system; emphasizes group think; socially extensive and accommodating
Theory of knowledge spread	Spontaneous diffusion based on merit.	Repeated processes of generation.

Source: Based on Gibbons, M., Limoges, C., Nowotny, H., Schwartzman, S., Scott, P. & Trow, M. 1994. The New Production of Knowledge: The Dynamics of Science and Research in Contemporary Societies. SAGE. 194 pp.

ANNEX 2: INITIATIVES RELATED TO FARMER FIELD SCHOOLS ON AGROFORESTRY AND FORESTRY, IDENTIFIED DURING THIS STOCKTAKING

Country	Implementing agencies	Period	Themes	No. of graduates*
Brazil	Central de Abastecimento da Bahia (CEASA), Hanns R. Neumann Stiftung	2012–2016	Coffee	2 000
Cameroon (part of a programme also implemented in Ghana, Côte d'Ivoire and Nigeria)	Ministry of Agriculture and Rural Development (MINADER), National Program for Agricultural Extension and Research (PNVRA), United States Agency for International Development (USAID)	2001–2011	Cacao	
Cameroon	Services d'Appui aux Initiatives Locales de Développement (SAILD), Bread for the World	2017–2021	Pigeon pea and annuals	2 000
Colombia	Ashohofrucol, Federación Nacional de Cacaotero (FEDECACAO), Fondo Nacional de Fomento Hortifrutícola (FNFH), USAID	2011	Mango, avocado, citrus, plantain and others	21 000
Costa Rica	Mesoamerican Agro-Environmental Program (MAP-Norway) implemented by the Tropical Agricultural Research and Higher Education Center (CATIE)			
Côte d'Ivoire	National Agency for Rural Development (ANADER), National Center for Agronomic Research (CNRA), United Nations Framework Convention on Climate Change, United States Department of Agriculture (USDA), Inter-Professional Fund for Agricultural Research and Extension (FIRCA)			
Ecuador	Ministry of the Environment (MAE), Community-based Natural Resource Management Network (MACRENA), Instituto Nacional de Investigaciones Agropecuarias (INIAP), USAID	2005–2009	Native trees, cacao, coffee, fruit trees	3 000

Country	Implementing agencies	Period	Themes	No. of graduates*
El Salvador	FAO/Upscaling climate resilience measures in the dry corridor agroecosystems of El Salvador (RECLIMA) Global Competitiveness Leadership Program (GCL)		Drylands reforestation, food security	
Ethiopia	Orimia Bureau of Agriculture and Natural Resources Management, Japanese International Cooperation Agency (JICA)	2007–2018	Forest management, coffee, fruit trees, woodlots	>11 000
Guatemala	Hanns R. Neumann Stiftung		Coffee	
Honduras	*Asociación Nacional para el Fomento de la Agricultura Ecológica* (ANAFAE), Canadá-Honduras de Cadenas de Valor Agroforestales (CAHOVA), *Fundación Hondureña de Investigación Agrícola* (FHIA, Honduran Foundation for Agriculture Research), Zamorano	2004–2018	Coffee, cacao, fruit tree, reforestation	>10 000
India	Government of Andhra Pradesh, FAO	2018–present	Agroforestry, polycropping	
Indonesia	Good Return and Keling Kumang Credit Union (CUKK), Rural Empowerment and Agriculture Development Scaling-up Initiative (READ-SI), Asian Development Bank (ADB), Australian Aid, IFAD, USAID	1997–2014	Cashew, cacao, coffee, fruit trees, agroforestry, sustainable land management (SLM)	>100 000
Jamaica	Agricultural Cooperative Development International/ Volunteers in Overseas Cooperative Assistance (ACDI/ VOCA), USAID	2018	Agroforestry, climate change resilience	400
Kenya (United Republic of Tanzania, Ethiopia)	Kenyan Forestry Service, Kenya Tea Development Agency (KTDA), Lipton, JICA, Rainforest Alliance, Unilever, the Netherlands	2006–2017	Agro-pastoral, agroforestry, tea, fruit trees, woodlots	>10 000
Mexico	MAP-CATIE, USAID		Cacao, coffee, forest products, marketing	>5 000
Mozambique	Ministry of Agriculture (MAG), Economic Activities District Services (SDAE, *Serviços de Actividades Económicas*), European Union, Food and Agriculture Organization of the United Nations (FAO)	2020	Conservation, agroforestry, fruit trees, pastoral systems	

Country	Implementing agencies	Period	Themes	No. of graduates*
Nepal	Ministry of Forests and Environment, International Fund for Agricultural Development (IFAD), Nepal Swiss Community Forestry Project (NSCFP)	2000–2015	Firewood, community-based forestry (CBF), agroforestry, fruit trees, SLM, watershed	>7 000
Peru	*Programa de Desarrollo Productivo Agrario Rural* (Agro-Rural, Rural Agricultural Productive Development Programme), Ministry of Agriculture and Irrigation (MINAGRI), Asociación de Productores de Cacao de Piura (APROCAP), FAO, Swisscontact	2009–2017	Cacao, coffee, marketing	>6 200
Philippines	Department of Agriculture, IFAD	2008–2021	Coffee, cacao, fruit trees, intercropping, forest fire protection	
GEF-funded Transboundary Agro-Ecosystem Management Project for the Kagera River Basin (Kagera-TAMP) (Burundi, Rwanda, United Republic of Tanzania, Uganda)	FAO, the GEF	2009–2014	Agroforestry, fruit tree, SLM, climate change, woodlots	>3 500

*Note: Over time, many programmes were handed over to local organizations. As a result, it was difficult to provide accurate number of graduates. The numbers are limited to the noted time period.

ANNEX 3: THE PEOPLE INTERVIEWED

Name	Position/ Organization	Country
Almalinda Abubakar	Consultant	Philippines
Kaia Ambrose	Consultant	Canada
Jean-Phillippe Audinet	Senior Technical Adviser, IFAD	Rome
Fidel Caballero	Technical Coordinator, Federación Nacional de Productores de Cacao de Honduras (FENAPROCACAHO)	Honduras
Julio Cabezas	Agroforestry Consultant	Brazil/Ecuador
Ruben Campos	Community Forestry Brigade	Ecuador
Konda Chavva	Assistant Representative, FAO	India
Jacqueline Chenier	Consultant	UK
Wain Collin	Director, Los Aliados	Ecuador
Jose Diaz	Forestry Officer, FAO	Rome
Deborah Duveskog	Regional Emergency Officer, FAO	Kenya
Sophie Grouwels	Forestry Officer, Forest and Farm Facility, FAO	Rome
Magnus Grylle	Forestry Officer, FAO	Rome
Peter Gubbels	West Africa Coordinator, Groundswell International	Ghana
Takayuki Hagiwara	Regional Programme Leader, FAO Investment Centre	Rome
Robert Hofstede	Climate Change Consultant	Ecuador
Xiomara Izurieta	Consultant, EcoPar/Ilaló Verde	Ecuador
Johannes Ketelaar	Consultant	Thailand
Free de Koning	Senior Scientist, Conservation International	Washington, DC
Jessica Milgroom	Researcher and Facilitator, Cultivate	Spain
Yolanda Moposita	Community FFS Facilitator	Ecuador

Name	Position/ Organization	Country
Diego Naranjo	Secretary Environment, Quito	Quito
Cecilia Pacheco	Secretary Environment, Quito	Quito
Belen Paiz	Director, Fundación Pachamama	Ecuador
Max Ochoa	Farmer Field School Specialist, FAO Mozambique	Mozambique
Cinthya Peña Herrera	Director, Red Ambiental	Quito
Suzanne Phillips	Agricultural Officer, FAO	Rome
Anne-Sophie Poisot	Deputy Team Leader, FAO	Rome
Doina Popusoi	Consultant, IFAD	Rome
Fergus Sinclair	Chief Scientist, World Agroforestry Centre (ICRAF)	Kenya
Elaine Springgay	Forestry Officer, FAO	Rome
Andrew Taber	Forestry Team Leader, FAO	Rome
Makiko Taguchi	Agricultural Officer, FAO	Rome
Fernanda Tomaz da Rocha	Senior Technical Regional Specialist, IFAD-Latin America	Peru
Manari Ushigua	Sápara Community/Naku	Ecuador
Virginia Vallejo	Country Facilitator, Forest and Farm Facility, FAO	Quito

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